EXPANDED SITE INSPECTION REPORT

DELTA SHIPYARD
HOUMA, TERREBONNE PARISH, LA
EPA CERCLA ID NO. LAD058475419

Prepared for:

U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

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Submitted by:

Roy F. Weston, Inc.
5599 San Felipe, Suite 700
Houston, TX 77056
(713) 621-1620

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SIGNATURE PAGE

Lon Biasco
Superfund Site Assessments (6SF-RA)
U.S. Environmental Protection Agency
Work Assignment Manager

Date

Dan A. MacLennan for
John D. DiFilippo, P.E.
Roy F. Weston, Inc.
Zone Program Manager

12/6/96
Date

Carol H. Beche
for Robert B. Beck, P.E.
Roy F. Weston, Inc.
Site Manager

12/3/96
Date

Cecilia Shappee
Cecilia H. Shappee, P.E.
Roy F. Weston, Inc.
Quality Assurance Officer

12/3/96
Date

Eric Tate
Eric Tate
Roy F. Weston, Inc.
Project Team Leader

12/2/96
Date

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HOUMA, TERREBONNE PARISH, LOUISIANA
EPA CERCLA ID NO. LAD058475419

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LIST OF ACRONYMS AND ABBREVIATIONS

AST	aboveground storage tank
bgs	below ground surface
BNA	base-neutral-acid extractable semivolatile organic compound
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLP	EPA Contract Laboratory Program
CRDL	Contract-Required Detection Limit
CRQL	Contract-Required Quantitation Limit
EBI	Elevated Boats, Inc.
EMI	WESTON Environmental Metrics, Inc.
EPA	U.S. Environmental Protection Agency, Region 6
ESI	EPA Expanded Site Inspection
ESAT	EPA Environmental Sample Analysis Team
GEMS	EPA Graphical Exposure Modeling System
GPS	Global Positioning System
HASP	Health and Safety Plan
HRS	Hazard Ranking System
LDEQ	Louisiana Department of Environmental Quality
LDTD	Louisiana Department of Transportation and Development
NPL	National Priorities List
OVA	organic vapor analyzer
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PPE	probable point of entry
QA	quality assurance
QC	quality control

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

SARA	Superfund Amendments and Reauthorization Act of 1986
SDG	Sample Delivery Group
SIP	EPA Site Inspection Prioritization
TAL	CLP Target Analyte List
TCL	CLP Target Compound List
TDMS	WESTON Technical Data Management System
USGS	U.S. Geological Survey
VOC	volatile organic compound
WESTON	Roy F. Weston, Inc.

SECTION 1
INTRODUCTION

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the 1986 Superfund Amendments and Reauthorization Act (SARA), Roy F. Weston, Inc. (WESTON®) has completed an Expanded Site Inspection (ESI) of the Delta Shipyard site (EPA Identification No. LAD058475419) located in Houma, Terrebonne Parish, Louisiana (Figure 1-1). The U.S. Environmental Protection Agency (EPA) Region 6 retained WESTON to complete this investigation under EPA Contract Number 68-W9-0015 and Work Assignment Number 26-6JZZ.

This document represents the final report for the ESI. The purpose of this report is to provide the background information collected for the site, discuss the ESI sampling activities, and present the analytical data obtained as part of the investigation.

1.1 OBJECTIVES OF THE INVESTIGATION

The ESI is intended to be the final investigation in an ongoing screening process of known and potential hazardous waste sites. The purpose of this ESI is to identify immediate or potential threats that hazardous substances attributable to the site may pose to human health and the environment by documenting the existence and migration of hazardous substances related to the site and by identifying the receptors, or targets, potentially exposed to the hazardous substances. EPA will use the information obtained during the ESI to evaluate the site using the Hazard Ranking System (HRS) and to help decide if the site is a potential candidate for inclusion on the National Priorities List (NPL). The intent of the ESI is to provide the documentation necessary to either rank a site on the NPL or assign a "No Further Remedial Action Planned" (NFRAP) status.

1.2 SCOPE OF WORK

The ESI Scope of Work is centered on characterizing the site through the completion of limited site-related research, a site reconnaissance, and focused sampling activities. The focus of this investigation has been Pits 1 through 3, because potentially hazardous substances are exposed at the surface and there is a defined overland flow path for contaminant migration. As part of this ESI, WESTON performed the following major tasks:

- An on-site reconnaissance was performed on 7 March 1996 to document current site conditions and identify potential sources of hazardous substances at the site. As part of the reconnaissance, a survey of the site's vicinity was completed to identify potential receptors, or targets, of hazardous substance migration and exposure

attributable to the site. At the request of EPA, a second site reconnaissance was conducted on 27 June 1996 in which a video recording of site sources and conditions was completed and sent to EPA.

- A site-specific Task Work Plan (TWP) and Health and Safety Plan (HASP) were prepared to provide a detailed plan of action for subsequent ESI activities.

- Information concerning the environmental setting of the site was obtained to describe the groundwater, surface water, soil exposure, and air pathways.

- Available regulatory compliance files from federal, state, and local government agencies were reviewed, and telephone interviews were conducted with authorities knowledgeable of the site and its surroundings.

- All of the available information from on-site observations, records review, interviews, site area environmental and demographic characteristics, and historical sample analyses were evaluated.

- WESTON mobilized equipment and personnel for executing the field sampling program of the TWP to Houma, Louisiana on 21 July 1996. Samples were collected in known or suspected source areas at the site and in suspected off-site pathways of contaminant migration and exposure. The samples were collected in general accordance with the site-specific TWP and HASP to document the presence and migration of hazardous substances attributable to the site.

- WESTON sent most of the samples collected during the ESI to be analyzed by EPA-assigned Contract Laboratory Program (CLP) laboratories. The EPA Drinking Water Laboratory performed analyses of selected low concentration water samples. WESTON Environmental Metrics, Inc. (EMI) performed analyses of medium and high concentration samples.

- WESTON received and reviewed the laboratory generated analytical data validated by EPA.

- WESTON managed the analytical data generated for the project using WESTON's Technical Data Management System (TDMS) computer database. TDMS was used to store, query, and tabulate the data that were received electronically from the EPA data validators. The Delta Shipyard site TDMS database was completed after receipt of the last data package from EPA.

- The analytical data were evaluated to verify their usability in meeting the objectives of the investigation. The evaluation was based on EPA Environmental Sample Analysis Team (ESAT) validation comments and other technical quality assurance

factors. TDMS-generated reports summarizing the ESI raw analytical data are provided in Appendix C.

- Using the analytical data, WESTON evaluated the nature and extent of site-related soil, sediment, groundwater, and surface water contamination in the site vicinity.

- This report was prepared to present the findings of the ESI.

1.3 REPORT FORMAT

The ESI Report is presented in a format that is intended to facilitate evaluation of the site using the HRS. The report contains the following sections:

- Section 1—Introduction
- Section 2—Site Characteristics
- Section 3—Sample Analyses and Data Evaluation
- Section 4—Source Characterization
- Section 5—Groundwater Pathway
- Section 6—Surface Water Pathway
- Section 7—Soil Exposure
- Section 8—Air Pathway
- Section 9—Conclusions
- Section 10—References

Additional information is provided in the appendices following the text of the report. The appendices are as follows:

- Appendix A—Photographs and Stream Sediment Sample Station GPS Coordinates
- Appendix B—Data Package Excerpts
- Appendix C—CRQLs, CRDLs, and Analytical Results Summary
- Appendix D—References

The figures and tables referred to throughout the subsequent sections of this report are provided following the text of each section. At the request of EPA Region 6, WESTON has not included the laboratory analytical data packages for the site in this report. Data tables summarizing the analytical data are included. The laboratory data will be maintained on file at WESTON's Houston office until it is requested by the EPA Work Assignment Manager (WAM).

SECTION 2
SITE CHARACTERISTICS

WESTON collected and reviewed available background information regarding the location, description, operational history and regulatory compliance of the site. The discussion in this section of the report is based on this background information, which is referenced throughout the text.

2.1 SITE DESCRIPTION AND BACKGROUND INFORMATION

The following characteristics of the site are summarized in this section of the report:

- Site Location
- Site Ownership
- Site Description
- Site Operational History
- Previous Investigations
- Nearby Land Use

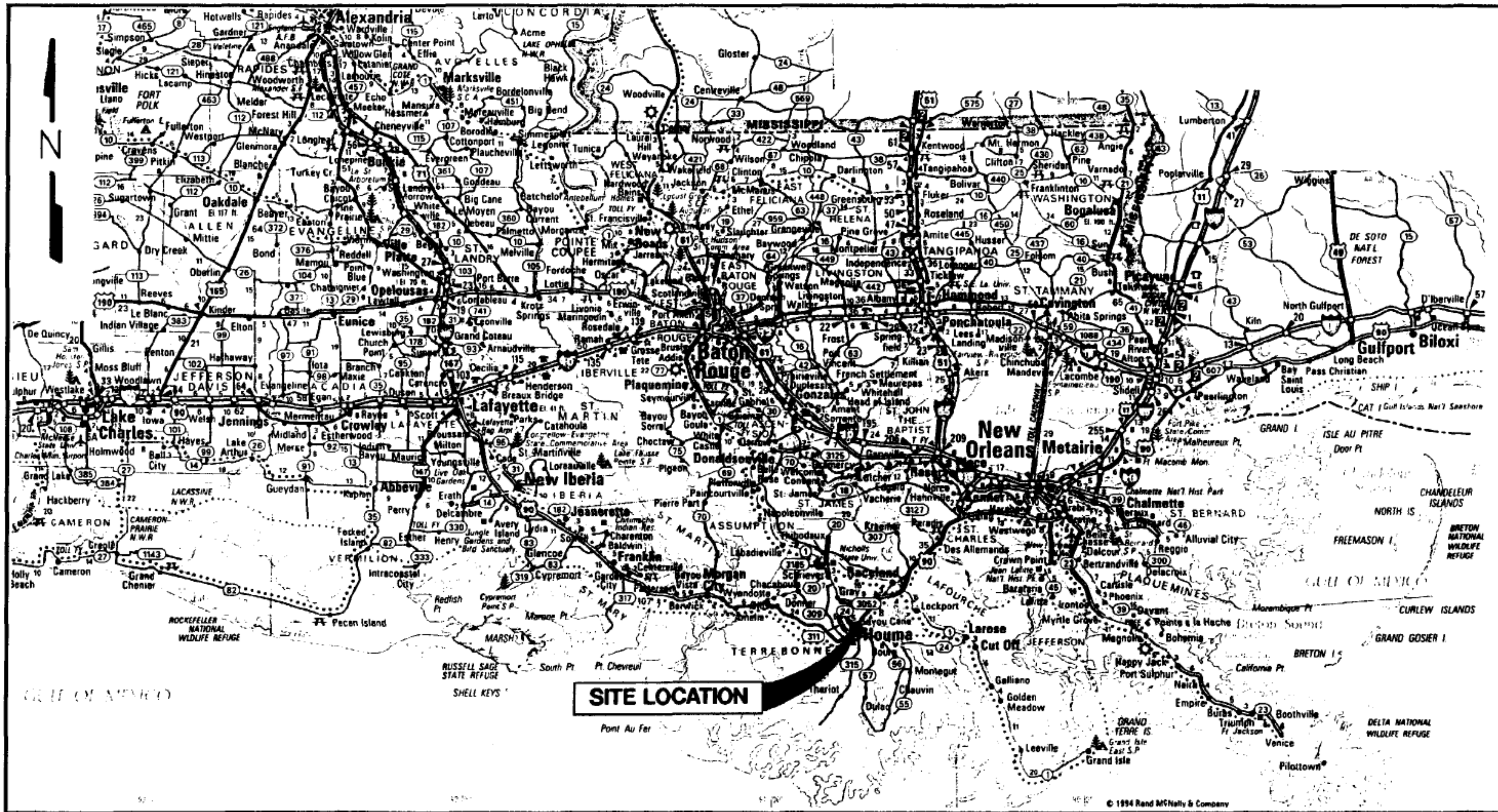
2.1.1 Site Location

The Delta Shipyard site is located in southeastern Houma, Terrebonne Parish, Louisiana. The geographic coordinates of the site are approximately 29°34'09" north latitude and 90°42'17" west longitude (Reference 1). A Site Area Map derived from a U.S. Geological Survey (USGS) 7.5-minute topographic map is provided as Figure 2-1 (Reference 2).

The site can be reached by traveling south on U.S. Highway 90 from New Orleans to Houma. Turn left (east) on Main Street and travel approximately 0.75 mile to Grand Caillou Road. Turn right (south) on Grand Caillou Road and travel approximately 2.2 miles to Industrial Boulevard. Turn right (west) on Industrial Boulevard. After approximately 1.5 miles, turn left (south) on Dean Road. The site address is 200 Dean Road.

2.1.2 Site Ownership

The site is currently owned by Mr. Lynn Dean and occupied by several industries including Elevated Boats, Inc. (EBI). WESTON contacted Mr. Dean (8404 Colonel Drive, Shelmett, Louisiana 70043) in January 1996. Mr. Ken Serigne, Plant Manager for EBI ([504] 868-9655), signed an EPA Access Agreement form on 13 February 1996 allowing WESTON access to the site (Reference 3). WESTON met with Mr. Serigne during the site reconnaissance and sampling visit (Reference 4).



MAP PREPARED FROM
RAND McNALLY ROAD ATLAS
LOUISIANA
1990 EDITION

0 15 30
APPROXIMATE SCALE IN MILES

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FIGURE 1–1
SITE LOCATION MAP
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419

EPA REGION VI
ARCS EXPANDED SITE INSPECTION

W.O. NO. : 04603–026–031–0100

2.1.3 Site Description

WESTON completed the ESI site reconnaissance on 7 March 1996. WESTON performed the reconnaissance in general accordance with the following documents:

- WESTON's Generic Site Inspection Work Plan (Document Control No. 4603-23-0008, dated 15 August 1991).
- The site-specific HASP prepared by WESTON for the ESI.
- The EPA Guidance for Performing Site Inspections under CERCLA, September 1992.

During the site reconnaissance, two WESTON personnel visited the site, interviewed site personnel, walked around the property, recorded observations in a logbook, and took photographs (Appendix A) to document site conditions (Reference 4). The area surrounding the site was examined to identify potential receptors, or targets, of hazardous substance migration from the site. Nearby land use and potential alternative source sites also were documented. At the request of EPA, WESTON conducted a second site reconnaissance on 27 June 1996. During this reconnaissance, a video recording of on-site sources and conditions was completed and sent to EPA. A Site Plan is provided as Figure 2-2.

EBI maintains a fabrication plant/office building on-site. Current site operations consist of the fabrication and operation of offshore lift boats and the manufacture of cranes for offshore platforms. The site contains some former gas stripping equipment (storage tanks, separator, boiler) remaining from historical Delta Shipyard operation. An employee parking lot is located approximately 100 feet east of the fabrication building and is bounded to the north by a mobile home. A groundwater monitoring well is located near the northeastern corner of the parking lot.

Four unlined pits are located approximately 800 feet south of the fabrication building (Pits 1 through 4 on Figure 2-2). The pits were reportedly used by previous owners/operators to dispose of waste oil and oil field drilling material (Reference 5). The outer perimeter of the Pits 1 through 3 consists of a berm which also separates Pits 2 and 3. The berm and surrounding area is heavily vegetated with scattered willow and other small trees, bamboo thicket, grasses, and weeds. A drainage ditch trends south along the western edge of Pits 1 through 3 before turning east along the southern edge of Pit 3 and discharging through a pipe to the Company Canal located east of the site. It appears that the drainage ditch originates somewhere along the northern edge of Pit 1, but it is difficult to determine because of the heavy site vegetation. The following are further details of the pits:

- Pit 1 is the smallest and northernmost pit, measuring approximately 125 feet by 150 feet (Reference 6). The ground surface inside the pit is dry and consists of heavy cracked soil near the edge of the pit and loose soil in the middle.

Approximately ¾ of the pit surface is covered with bamboo and small plants. Below the top 6 to 12 inches, the density of the soil decreases because of the presence of underlying sludge. WESTON measured the depth of the pit to be approximately 6.5 feet near the western edge. The berm is absent in a low-lying area near the northeastern corner of the pit. Surface drainage from Pit 1 would likely drain north into what appears to be the beginning of the aforementioned drainage ditch. The berm is also absent along the southern edge of the pit. As such, Pits 1 and 2 are not hydraulically separated.

- Pit 2 measures approximately 400 feet by 150 feet (Reference 6), and it appears to be connected to Pit 1 at its northeastern corner. The ground surface is black, cracked, and crusty and generally unstable near the pit edge. Elsewhere, the pit is covered by sparse vegetation and rainwater with an oily sheen. Mild hydrocarbon odors were noted. WESTON measured the depth of the pit to be approximately 6.5 feet near the western edge. An overflow pipe connected to the drainage ditch is located near the midpoint of the pit's western edge. During the WESTON ESI site visits, the overflow pipe was plugged.

- Pit 3 measures approximately 325 feet by 150 feet (Reference 6) and is completely devoid of vegetation. The ground surface inside the pit edge is black and very unstable; the majority of the pit is covered with rainwater with an oily sheen. Strong hydrocarbon odors were noted. Due to the instability of the surface, WESTON was unable to estimate the depth of Pit 3.

- Pit 4 is located west of Plant Shell Road and is overgrown with grass. Based on available historical information, Pit 4 actually consisted of three pits that were at one time separated by berms. The aggregate size of the pits is approximately 465 feet by 360 feet (Reference 6).

2.1.4 Site Operational History

The early details of the site history are sketchy but indicate that the site was owned by Delta Ironworks. The site was part of a large industrial park covering 165 acres and home to seven divisions of Delta Ironworks, including Delta Shipyard. Available information indicates that Delta Shipyard was the only division that handled hazardous wastes. In 1969, Delta Ironworks was sold to the Chromalloy American Corporation of St. Louis, Missouri. Chromalloy maintained all seven divisions until November 1980 when five of the divisions (including Delta Shipyard) were sold to Delta Services Industries of Houma, Louisiana (Reference 7). Mr. Dean purchased 110 acres of the industrial park from Delta Services in 1986 including the property used by Delta Shipyard (Reference 4).

Delta Shipyard consisted of a cleaning and repairing facility for small cargo boats, fishing boats, and oil barges. Before repair work could begin, the boats had to be certified vapor free by the U.S.

Coast Guard. In order to accomplish this, the boats were first steam cleaned to remove oily wastes. The generated oils and wastewater were subsequently sent through a separation process after which the waste oil was recovered and sold. Wastes were stored in several unlined pits used as evaporation ponds (Reference 7). Two of the pits were later closed and backfilled in 1984 under the supervision of the Louisiana Department of Environment Quality (LDEQ) Hazardous Waste Division (Reference 5). This area is currently covered with gravel and used as a parking lot for EBI employees.

2.1.5 Previous Investigations

WESTON reviewed available EPA and LDEQ files to collect information regarding previous investigations completed at the Delta Shipyard site. This information is summarized in the following paragraphs.

- On 3 to 4 November 1980, Soil Testing Engineers, Inc. completed two 50-foot soil borings adjacent to the two closed pits located near the current EBI office building. Soil samples were collected from the borings and submitted to a geotechnical laboratory for analyses. The results revealed the presence of silt and clay throughout the boring interval. The clay in the 0- to 15-foot range was found to have permeabilities ranging from 10^{-7} centimeters per second (cm/sec) to 10^{-8} cm/sec. Two monitoring wells were installed near the borings to depths of 13 and 20 feet below ground surface (bgs) (Reference 8). WESTON could only located one of these wells during the ESI site visits.

- On 11 March 1981, Ecology and Environment, Inc. completed an EPA Preliminary Assessment and Site Inspection. The reports detailed available site history and indicated that the site received five hundred 55-gallon drums per year containing oily wastes and that the associated waste manifests were maintained on-site. A list of Delta Shipyard's primary customers was also provided (References 7 and 9).

- On 10 May 1983, the Louisiana Department of Natural Resources (LDNR) performed an inspection of the Delta Shipyard site and subsequently issued a Notice of Violation. Eight violations were noted, among these were that "there was no indication that (the) facility was having their waste treated, stored, or disposed of at a (permitted) hazardous waste facility," and the "facility has not developed and adhered to a groundwater sampling and analysis plan" (Reference 10).

- On 12 September 1984, The Earth Technology Corporation completed an EPA Site Inspection. The report summarized the closure of the two waste oil pits in early 1984. According to the report, the pits were first drained and samples of the oil sludge remaining in the bottom were collected. The sludge samples were then analyzed for corrosivity, toxicity, ignitability, and reactivity. Following LDEQ review of the sample results, the remaining sludge was reportedly mixed with 30

cubic yards of sandy soil prior to backfilling. Following the pit closures, an aboveground storage tank (AST) was installed to replace the pits in the oil-water separation process (Reference 5).

- In June 1985, Wink Engineering collected sludge samples from Pits 1 through 4. The report indicated that Pits 1 through 3 were exposed, and Pit 4 was covered with a thin crust of fill material. The samples were analyzed for volatile organic aromatics, cyanide, total phenol, flash point, pH, toxicity, and oil & grease. Based on the results, the report concluded that the site did not pose a threat to human health or the environment (Reference 6).

- On 16 April 1986, LDEQ collected samples from on-site tanks and pits. The tanks were reportedly used in conjunction with the steam cleaning operation. The pit samples included two composites from the closed pits and three grabs from Pits 1 through 3. The samples were analyzed for volatile organic compounds (VOCs), metals, and polychlorinated biphenyls (PCBs). However, the laboratory analytical data are not included in available file information (Reference 11).

- WESTON completed a Site Inspection Prioritization (SIP) report in December 1994. A limited number of pit sludge and drainage ditch sediment samples were collected in and around Pits 1 through 4 during the investigation. (During field activities, the Pit 2 overflow pipe was observed transmitting water from the pit to the drainage ditch.) The analytical results revealed the presence of elevated concentrations of several semivolatile organic compounds (primarily polycyclic aromatic hydrocarbons [PAHs]) and metals (Reference 12).

2.1.6 Nearby Land Use

The site is located in a large industrial park, which covers approximately 165 acres in southeastern Houma. The industrial park forms a peninsula bordered by Bayou La Carpe to the west, a ship channel named the "Company Canal" to the east, and Industrial Boulevard to the north. Bayou La Carpe provides access to the Gulf of Mexico through the Houma Navigation Canal. Mr. Dean currently owns 110 acres of the industrial park, which is occupied by EBI and several other industries including Gemoco, Robichaux Equipment, and Sigma Welders to the north; Montco (Christie Industries), Salvage Associates, and Huber to the south; and Offshore Diving, LaForce Enterprise, and Tomahawk to the west.

2.2 SOURCE AREAS AND SITE CONCERNS

The source areas identified at the site are described in this section along with site-related concerns regarding the migration of hazardous substances attributable to the site by the groundwater, surface water, soil exposure, and air pathways.

2.2.1 Source Areas

Based on available background information, the potential sources identified at the site include six pits and an AST. The two closed pits each measured 75 feet by 35 feet by 5 feet in depth, are currently backfilled and covered with gravel, and are used as an employee parking lot. The AST has a capacity of 22,800 gallons and contains an unknown quantity of waste oil sludge, reportedly from historical Delta Shipyard activities. The AST is adjacent to the closed pits and is encompassed by a 1-foot berm. Since the sludge volume in the AST is not known, it is unclear if the berm would provide sufficient containment in the event of a leak. Data detailing the contents of the chemical composition of the closed impoundments and AST are not available. Pit 4 currently appears as a grassy field, but was observed in 1985 to have a thin crust of fill and overgrowth of vegetation (Reference 6). The focus of this investigation has been Pits 1 through 3, because potentially hazardous substances are exposed at the surface and there is a defined overland flow path for contaminant migration. As such, the potential source areas described above (closed pits, AST, and Pit 4) will not be discussed further in this report. Information regarding Pits 1 through 3, ESI field activities, and analytical results is presented in Section 4, Source Characterization.

2.2.2 Site Concerns

The migration of hazardous substances from Pits 1 through 3 and the exposure of humans and other environmental receptors to the hazardous substances is of concern. Possible concerns associated with the sources at the site and the migration of, or exposure to, hazardous substances attributable to the site through the groundwater, surface water, soil exposure, and air pathways include the following:

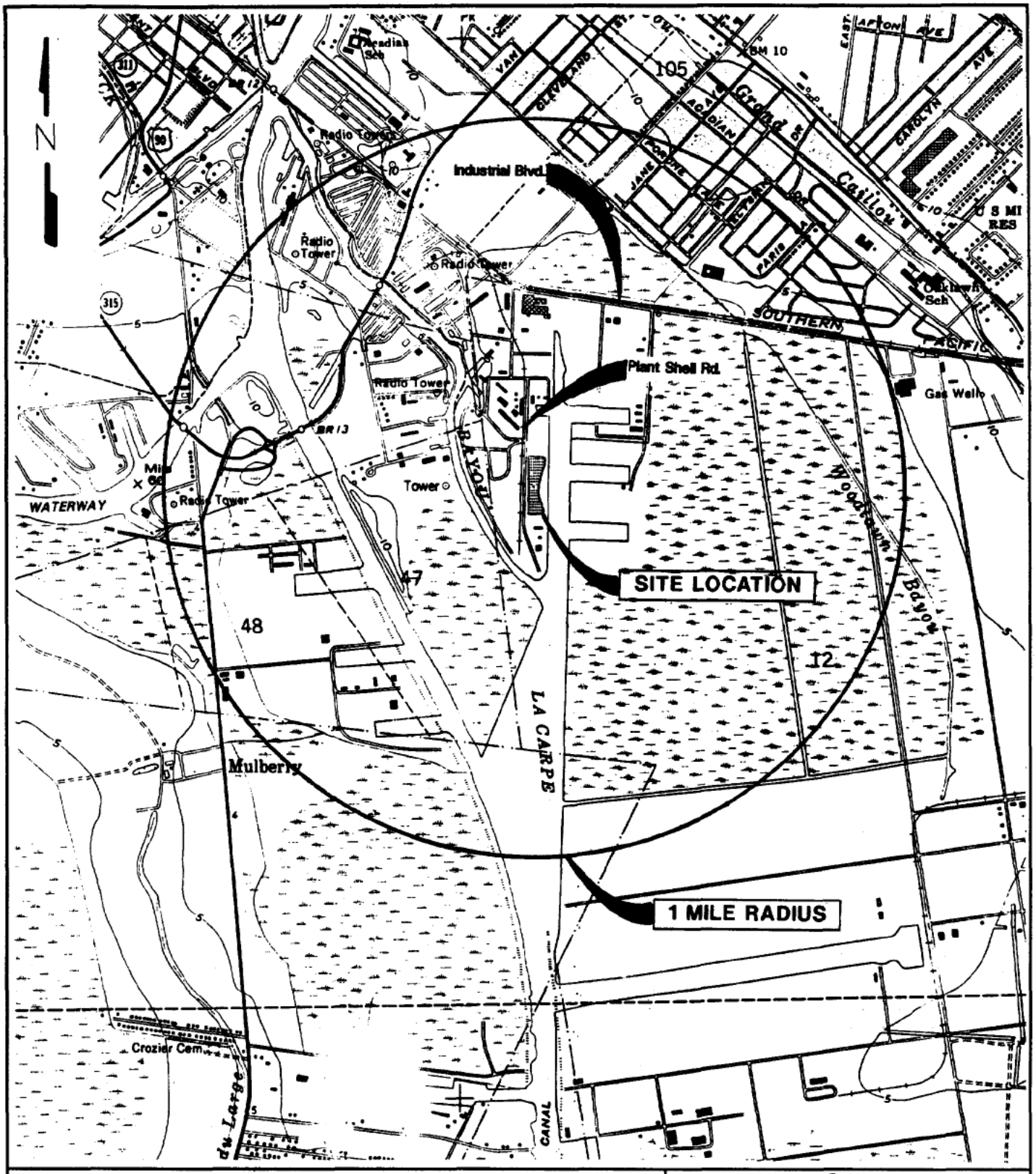
- The presence of hazardous substances at the site is of general concern. A discussion of the waste characteristics of the sources sampled during the ESI is provided in Section 4 of this report.

- It is suspected that the waste oil pits at the site are unlined, and a release to groundwater has occurred. However, due to the low permeability of area subsurface soils and the lack of groundwater use in the site vicinity, the groundwater pathway appears to be of minor concern. The groundwater pathway is discussed in Section 5.

- Based on the appearance of related hazardous constituents in Pits 1 through 3 and the associated drainage ditch, the surface water pathway is of major concern at the site. The drainage ditch discharges to the perennially flowing Company Canal approximately 100 feet southeast of Pit 3. In addition, based on the limited distance between the pits and adjacent surface water, the potential exists for contaminant migration through groundwater to surface water discharge. Drinking water intakes, fisheries, and sensitive environments are each located in the surface water pathway for the site. The surface water flow path is discussed further in Section 6.

- A release to surface soil has been documented based on historical laboratory analytical results. However, the site is located in an industrial area, and the pits are neither frequented by workers nor attractive to the general public. As such, the soil exposure pathway appears to be of minor concern. The soil exposure pathway is discussed in Section 7.

- A release to air is of concern based on the results of field air monitoring. However, the air borne contaminants appear to be confined within the pit berms, and the population density in the immediate site vicinity is low. The air pathway is discussed in Section 8.



BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
HOUMA QUADRANGLE
LOUISIANA
7.5 MINUTE SERIES (TOPOGRAPHIC)
1963 SERIES

0 1000 2000
SCALE IN FEET

WESTON

FIGURE 2-1

SITE AREA MAP

DELTA SHIPYARD
HOUMA, LOUISIANA

CERCLA ID. NO. : LAD058475419

EPA REGION VI
ARCS EXPANDED SITE INSPECTION

W.O. NO. : 04603-026-031-0300

SECTION 3
SAMPLE COLLECTION, ANALYSIS, AND DATA EVALUATION

In general accordance with the objectives of the ESI, WESTON implemented a sampling strategy aimed at documenting the presence and migration of hazardous substances at the Delta Shipyard site. WESTON collected 62 soil, sludge, sediment, groundwater, surface water and quality assurance samples from on- and off-site locations on 22 through 26 July 1996. The sampling activities were completed in general accordance with the site-specific TWP and HASP, as well as the other documents listed in Subsection 2.1.3.

EPA contract laboratories, WESTON EMI, EPA Region 6, and WESTON performed sample analyses, data validation, data management, and data evaluation efforts as part of the Delta Shipyard ESI. These tasks were completed in general accordance with CLP guidelines and the ESI Work Plan. The activities performed for these tasks are described in this section as follows:

- Sample Collection
- Sample Analyses and Data Reporting
- Data Validation and Usability
- Data Management and Evaluation
- Quality Assurance Results

3.1 SAMPLE COLLECTION

As part of the ESI, WESTON collected 7 pit sludge samples, 6 surface and subsurface soil samples, 2 groundwater samples, 4 surface water samples, 37 stream sediment samples, and 6 field QC samples. The sample nomenclature is based on specific code requirements for compatibility with WESTON's TDMS computer database. The nomenclature followed the format of **Station ID - Collection Type + QC Type - Sequential Sample**. This nomenclature is further described as follows:

- **Station ID** is a three digit identifier used to designate sample location. The first digit refers to the type of sample station and the subsequent two digits identify the station number. For sample station type, the letter B is used to designate boring sample stations, the letter D for drainage ditch and stream sediment sample stations, the letter P for pit sample stations, and the letter W for surface water sample stations. For example, D01 refers to sediment sample station number one.

- **Collection Type** is a one digit code used to designate the sample media. The number 1 is used to denote surface water, 2 for groundwater, 4 for field QC samples, 5 for soil/sediment, and 7 for waste/sludge.

- **QC Type** is a one digit code used to designate the QC type of the sample. The number 1 is used to designate normal QC type, 2 for field duplicates, 3 for equipment rinsate blanks, and 5 for field blanks.

- **Sequential Sample** is a one digit code that represents the n^{th} sample of common collection types.

For instance, the sample nomenclature B02-51-3 represents the third normal soil sample collected at boring station 2; the nomenclature P05-72-1 represents the duplicate of the first waste/sludge sample collected at pit station 5. The ESI sample stations are shown on Figures 3-1 and 3-2, and the sample stations, descriptions, and rationales are summarized in Table 3-1.

3.2 SAMPLE ANALYSES AND DATA REPORTING

During field activities, WESTON collected and shipped soil, groundwater, surface water, sediment, waste, field blank and rinsate blank samples to various laboratories by Federal Express Priority Overnight Service. Low-concentration samples requiring target compound list (TCL) and target analyte list (TAL) analyses were shipped to the CLP laboratories that were assigned by EPA to the project. Specifically, samples requiring organic analyses were sent to Chemtech, Englewood, New Jersey, and samples requiring inorganic analyses were sent to Compuchem Environmental Corp., Research Triangle Park, North Carolina. Medium- and high-concentration samples requiring TCL and TAL analyses were shipped to WESTON EMI in University Park, Illinois for analyses using CLP protocol. Surface water samples were sent to the EPA Drinking Water Laboratory in Houston, Texas. The laboratories analyzed the samples for the following:

- Volatile organic compounds (VOCs).
- Base-neutral and acid extractable semivolatile organic compounds (BNAs).
- Pesticide and polychlorinated biphenyl (PCB) constituents.
- Inorganic constituents and cyanide.

The TCL and contract-required quantitation limits (CRQLs) for the parameters listed above are provided in Table C-1 in Appendix C. The TAL and contract-required detection limits (CRDLs) are provided in Table C-2.

The laboratories reported the analytical results obtained from the samples in data packages meeting CLP requirements. The laboratory documentation in these raw data packages include records of instrument readings, calculations, calibrations, and quality assurance checks. The original chain-of-custody records for the samples are included with the data packages, which are being maintained in

the project files of WESTON's Houston, Texas, office until requested by EPA or closeout of the ESI Work Assignment.

3.3 DATA VALIDATION

ESAT in Houston, Texas, performed data validation for the analytical data packages generated by the CLP laboratories and WESTON EMI. ESAT reviewed the data packages to verify that they met the EPA technical requirements and quality assurance (QA) guidelines established in EPA CLP Scope of Work documents for the analyses. ESAT reviewed the data packages for the following general QA items:

- The sample holding times were reviewed to verify that the samples were analyzed within contractual and technical holding time limits.
- The instrument calibrations were reviewed to verify that the calibration for target compounds met contractual quality control (QC) criteria.
- Analyses were performed on method blanks, and these results were reviewed to locate potential bias.
- Surrogate recoveries were reviewed to verify that recoveries were within contractual requirements.
- Matrix spike recoveries were reviewed to verify that method recoveries were within acceptable QC limits and to determine if biases in the samples results were possible.
- Duplicate results were reviewed to verify that laboratory precision was within technical QC limits.

The ESAT comments are included in the data package excerpts presented in Appendix B.

3.4 DATA USABILITY

In light of potential QC issues raised in the validation reports, WESTON evaluated the data to verify that the data were usable for developing and meeting the objectives of the ESI. Review of the data validation reports indicates that most of the ESI data for site-attributable constituents were generated within CLP-allowable analytical QC tolerances. For the data generated outside of QC limits, the reported data quality issues were minor and do not affect overall data usability. In some cases, data generated outside of analytical QC limits may have resulted in biases in some of the results. The usability of such data was evaluated based on the potential bias in the results, as follows:

- The data generated by analyses within the CLP contract-required laboratory QC limits were considered unbiased and have been used for the ESI without qualification. This includes all data reported to be acceptable by ESAT. Most data for site-related constituents falls in this category.

- The data generated by analyses outside of QC tolerances were evaluated by ESAT for potential bias in the results. Sample results, which are potentially biased low (i.e., the reported concentrations are potentially lower than the actual concentrations in the sample) or biased high, are used without additional qualification, but they are marked biased in the data tables presented in Appendix C of this report. This includes data qualified as provisional but usable by ESAT. Potentially biased data have been qualified as estimated and are J-flagged. Some data for site-specific constituents fall in this category.

Relevant BNA and metals validation issues are presented in Table 3-2. No relevant validation issues emerged for VOC, pesticide, or PCB analyses.

WESTON added contractor evaluation qualifiers to the data above background comparison values to highlight issues (including potential data bias and lack of attribution to the site) where appropriate. These qualifiers appear on the ESI data tables of Section 4 and Appendix C. The contractor-specified qualifiers are described as follows:

- C:BSQL—This qualifier was added to results below the laboratory sample quantitation limit for the given analysis.

- C:NA—This qualifier was added to reported constituent concentrations that were detected but not known to be attributable to the Delta Shipyard site.

3.5 BACKGROUND DATA

ESAT did not report any significant data quality issues affecting the usability of the background sample data. The data are usable and largely unbiased. The results of each background sample were used to characterize soil, sediment, groundwater, and surface water background conditions in the ESI study area. The ESI sample stations are shown on Figures 3-1 and 3-2, and the sample stations, descriptions, and rationales are summarized in Table 3-1.

3.5.1 Background Evaluation

In order to establish media-specific background constituent levels, background samples were collected at 8 sample stations. For background soil and drainage ditch sediment concentrations, an on-site sample was collected at station D01, an upgradient location in the intermittent drainage ditch. Surface water background levels are based on the analytical results of off-site sampling conducted at station W01, located along Bayou Black. Because of the hydraulic connection

between surface water and groundwater (further discussed in Section 5), W01 was also used as the background groundwater station. To establish background comparison values, the analyte concentrations for stations D01 and W01 were multiplied by a factor of three. Background comparison values were assumed to be zero for undetected constituents.

To determine background stream sediment concentrations, bottom sediment samples were collected at stations D14, D15, D16, D32, D33, and D34. Background comparison values being reported for each constituent were determined by taking the maximum detected constituent value of each analyte among the six background sediment samples, and multiplying by three. Background comparison values were assumed to be zero for constituents not detected in the background samples.

3.5.2 Background Results

The background results are presented in Appendix C. The results were generally acceptable with the notable exception of those from station D01. Although station D01 is located hydraulically upgradient of the pits, the slope is slight and it is suspected that D01 receives upgradient flow in times of heavy rain. The sample was stained black and emitted a hydrocarbon odor; the analytical results indicated elevated concentrations of several BNAs and metals. These include benzo(b)fluoranthene (0.54 milligrams per kilogram [mg/kg]), pyrene (0.58 mg/kg), barium (11,200 mg/kg), and zinc (2,350 mg/kg). Due to these elevated constituent concentrations, the results from station D01 were not used in the determination of background soil and on-site drainage ditch comparison values. As an alternative, values based on the analytical results of the background soil sample (SS-01) collected during the 1994 SIP were used.

3.6 EVALUATION OF ESI/RI STUDY AREA DATA

As described above, the analytical results for the ESI characterization samples were compared to three times the media-specific background concentrations to determine whether the reported concentration values exceed background conditions. After determining which detected study area sample constituents exceeded background comparison values, additional data evaluation was performed to determine which constituents were site-attributable. Constituents detected in off-site samples were attributed to the site if they had been previously reported in on-site source samples. The results of source sampling is discussed in Section 4; the remaining characterization samples are discussed in Sections 5 through 7.

3.7 QUALITY ASSURANCE ANALYTICAL RESULTS

WESTON collected six blind field duplicate samples, five equipment rinsate blanks, and one field blank for QA. The analytical results for the QA samples are presented in Appendix C.

The blind field duplicate results are generally acceptable with the exception of the samples collected at station D02. According to ESAT, the naphthalene, 2-methylnapththalene, acenaphthylene,

and phenanthrene results in samples D02-51-1 and D02-52-1 were detected in only one of the duplicates or had a 10X difference in concentrations between duplicates. As a result, the detected results for those analytes in samples D02-51-1 and D02-52-1 were qualified as estimated by ESAT. Generally, blind field duplicate results and the percent difference between the concentrations reported for a duplicate versus the parent sample can be an indicator of laboratory precision. However, variances between duplicate and parent sample results could also be caused by matrix interference and/or sample heterogeneity.

Rinsate blank samples were collected to evaluate the effectiveness of equipment decontamination procedures. The rinsate blanks were collected by pouring deionized water over decontaminated equipment (dredge sediment sampler, shelby tube, hand auger) and collecting the rinse water in the appropriate sample containers. In general, the analytical results indicate that sampling equipment decontamination was sufficiently performed. However, low levels of metals and phthalates were found in some of the rinsate samples. At station D11, the rinsate sample collected from the dredge sediment sampler contained detectable levels of several metals. At station B02, the rinsate sample collected from the geoprobe shelby tube contained low levels of three phthalate compounds and metals. The rinsate sample collected from a hand auger at station P02 also was characterized by low levels of metals contamination. However, for each of the corresponding characterization samples, the metals concentrations exceed those found in the rinsate samples by at least one order of magnitude. Furthermore, the phthalate contamination is likely attributable to laboratory contamination. Based on this information, the equipment rinsate results do not appear to affect the usability of the ESI data and overall evaluation of the results.

Table 3-1
Delta Shipyard (CERCLIS ID LAD058475419)
Sampling Station Descriptions and Rationales

Station Identification/Type	Description	Rationale	Sample Identification/QC Type
B01 Characterization	Shallow soil boring between Pit 2 and the Company Canal.	Soil and groundwater samples collected to evaluate extent of contaminant migration.	B01-21-1 Normal B01-45-1 Field Blank B01-51-1 Normal B01-51-2 Normal B01-52-1 Duplicate
B02 Characterization	Shallow soil boring between Pit 3 and the Company Canal.	Soil and groundwater samples collected to evaluate extent of contaminant migration.	B02-21-1 Normal B02-43-1 Rinsate Blank B02-43-2 Rinsate Blank B02-51-01 Normal B02-51-02 Normal B02-51-03 Normal
D01 Characterization	Drainage ditch station located approximately 400 feet north of the Pit 2 overflow pipe.	Low concentration sediment sample collected to establish on-site background constituent concentrations.	D01-51-1 Normal

Table 3-1 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sampling Station Descriptions and Rationales

Station Identification/Type	Description	Rationale	Sample Identification/QC Type
D02 Characterization	Drainage ditch station located beneath the Pit 2 overflow pipe.	Low concentration sediment sample collected to document contamination in the overland flow path.	D02-51-1 Normal D02-52-1 Duplicate
D03 Characterization	Drainage ditch station located near the southwestern corner of Pit 3.	Low concentration sediment sample collected to document contamination in the overland flow path.	D03-51-1 Normal D03-52-1 Duplicate
D04 Characterization	Drainage ditch station located at the probable point of entry to the surface water pathway.	Low concentration sediment sample collected to document contamination in the overland flow path.	D04-51-1 Normal
D05 Characterization	Located in the Company Canal at the PPE.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D05-51-1 Normal D05-52-1 Duplicate
D06 Characterization	Located in the Company Canal at the PPE.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D06-51-1 Normal
D07 Characterization	Located in the Company Canal at the PPE.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D07-43-1 Rinsate Blank D07-51-1 Normal
D08 Characterization	Located approximately 500 feet south of the site at the confluence of the Company Canal and Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D08-51-1 Normal
D09 Characterization	Located approximately 500 feet south of the site at the confluence of the Company Canal and Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D09-51-1 Normal

Table 3-1 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sampling Station Descriptions and Rationales

Station Identification/Type	Description	Rationale	Sample Identification/QC Type
D10 Characterization	Located approximately 500 feet south of the site at the confluence of the Company Canal and Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D10-51-1 Normal
D11 Characterization	Located in Bayou La Carpe, approximately 4,000 feet downstream of the confluence with the Intracoastal Waterway, and approximately 2,000 feet north of the site.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D11-43-1 Rinsate Blank D11-51-1 Normal
D12 Characterization	Located in Bayou La Carpe, approximately 4,000 feet downstream of the confluence with the Intracoastal Waterway, and approximately 2,000 feet north of the site.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D12-51-1 Normal
D13 Characterization	Located in Bayou La Carpe, approximately 4,000 feet downstream of the confluence with the Intracoastal Waterway, and approximately 2,000 feet north of the site.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D13-51-1 Normal
D14 Background	Located near the drinking water intake along Bayou Black.	Low concentration sediment sample collected to establish stream sediment background levels.	D14-51-1 Normal
D15 Background	Located near the drinking water intake along Bayou Black.	Low concentration sediment sample collected to establish stream sediment background levels.	D15-51-1 Normal
D16 Background	Located near the drinking water intake along Bayou Black.	Low concentration sediment sample collected to establish stream sediment background levels.	D16-51-1 Normal
D17 Characterization	Located near the Water Plant No. 3 drinking water intake along the Intracoastal Waterway.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D17-51-1 Normal
D18 Characterization	Located near the Water Plant No. 3 drinking water intake along the Intracoastal Waterway.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D18-51-1 Normal

Table 3-1 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sampling Station Descriptions and Rationales

Station Identification/Type	Description	Rationale	Sample Identification/QC Type
D19 Characterization	Located near the Water Plant No. 3 drinking water intake along the Intracoastal Waterway.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D19-51-1 Normal
D20 Characterization	Located in the Houma Navigational Canal, approximately 4,000 feet downstream of the confluence with the Intracoastal Waterway.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D20-51-1 Normal
D21 Characterization	Located in the Houma Navigational Canal, approximately 4,000 feet downstream of the confluence with the Intracoastal Waterway.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D21-51-1 Normal
D22 Characterization	Located in the Houma Navigational Canal, approximately 4,000 feet downstream of the confluence with the Intracoastal Waterway.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D22-51-1 Normal
D23 Characterization	Located in the Houma Navigational Canal, approximately 1,200 feet downstream of the confluence with Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D23-51-1 Normal
D24 Characterization	Located in the Houma Navigational Canal, approximately 1,200 feet downstream of the confluence with Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D24-51-1 Normal
D25 Characterization	Located in the Houma Navigational Canal, approximately 1,200 feet downstream of the confluence with Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D25-51-1 Normal
D26 Characterization	Located at the confluence of the Houma Navigational Canal and Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D26-51-1 Normal
D27 Characterization	Located at the confluence of the Houma Navigational Canal and Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D27-51-1 Normal
D28 Characterization	Located at the confluence of the Houma Navigaitonal Canal and Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D28-51-1 Normal
D29 Characterization	Located in the Houma Navigational Canal, approximately 2,200 feet downstream of the confluence with Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D29-51-1 Normal

Table 3-1 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sampling Station Descriptions and Rationales

Station Identification/Type	Description	Rationale	Sample Identification/QC Type
D30 Characterization	Located in the Houma Navigational Canal, approximately 2,200 feet downstream of the confluence with Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D30-51-1 Normal
D31 Characterization	Located in the Houma Navigational Canal, approximately 2,200 feet downstream of the confluence with Bayou La Carpe.	Low concentration sediment sample collected to document contamination in the surface water pathway.	D31-51-1 Normal
D32 Background	Located in the Intracoastal Waterway, approximately 1,000 feet south of Bayou Terrebonne.	Low concentration sediment sample collected to establish stream sediment background levels.	D32-51-1 Normal
D33 Background	Located in the Intracoastal Waterway, approximately 600 feet north of the confluences with Bayou Black and Bayou La Carpe.	Low concentration sediment sample collected to establish stream sediment background levels.	D33-51-1 Normal
D34 Background	Located in the Intracoastal Waterway, approximately 4,000 feet west of the Houma Navigational Canal.	Low concentration sediment sample collected to establish stream sediment background levels.	D34-51-1 Normal
P01 Characterization	Located in Pit 1.	High concentration waste sample collected for source characterization.	P01-71-1 Normal
P02 Characterization	Located in Pit 1.	High concentration waste sample collected for source characterization.	P02-43-1 Rinsate Blank P02-71-1 Normal
P03 Characterization	Located in Pit 2.	High concentration waste sample collected for source characterization.	P03-71-1 Normal
P04 Characterization	Located in Pit 2.	High concentration waste sample collected for source characterization.	P04-71-1 Normal
P05 Characterization	Located in Pit 3.	High concentration waste sample collected for source characterization.	P05-71-1 Normal P05-72-1 Duplicate
P06 Characterization	Located in Pit 3.	High concentration waste sample collected for source characterization.	P06-71-1 Normal
SS001 Background	Located north of the site in an area unaffected by site related activities.	Low concentration soil sample collected to establish background constituent concentrations in the soil exposure pathway.	SS001 Normal

Table 3-1 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sampling Station Descriptions and Rationales

Station Identification/Type	Description	Rationale	Sample Identification/QC Type
W01 Background	Located at the drinking water intake at the Bayou Black pump station.	Low concentration surface water sample collected to establish background constituent concentrations in the surface water pathway.	W01-11-1 Normal
W02 Characterization	Located at the Water Plant No. 3 drinking water intake along the Intracoastal Waterway.	Low concentration pre-treatment water sample collected to document contamination in the surface water pathway.	W02-11-1 Normal W02-12-1 Duplicate
W03 Characterization	Located at the Water Plant No. 3 along the Intracoastal Waterway.	Low concentration post-treatment water sample collected to document contamination in the surface water pathway.	W03-11-1 Normal

TABLE 3-2
RELEVANT DATA VALIDATION ISSUES

SDG	ANALYSIS	DATA QUALITY ISSUE	AFFECTED SAMPLE RESULTS
FFE73	BNA	Naphthalene, 2-methylnapththalene, acenaphthylene, and phenanthrene in samples D02-51-1 and D02-52-1 were detected in only one of the duplicates or had a 10X difference in concentrations between duplicates.	The naphthalene, 2-methylnapththalene, acenaphthylene, and phenanthrene results in samples D02-51-1 and D02-52-1 have been qualified as estimated.
FFE73	BNA	Samples D01-51-1, D01-51-1 MS/MSD, D02-52-1, and D03-52-1 had low IS responses.	Analyte results associated with IS6 in samples D01-51-1, D02-52-1, and D03-52-1 have been qualified as estimated and low bias.
FFE91	BNA	Two base/neutral surrogates had recoveries below QC limits for sample D05-51-1.	All base/neutral compound results in sample D05-51-1 have been qualified as estimated and low biased.
07G425	BNA	Sample B01-51-1 had low IS3 and IS4 responses, and it's MS/MSD analyses repeated the problem.	The analytes associated with the IS3 and IS4 in sample B01-51-1 have been qualified as estimated and low biased.
07G425	BNA	Sample P02-71-1 had low IS6 responses.	The analytes associated with the IS6 in sample P02-71-1 have been qualified as estimated and low biased.
MFGW06	Metals	Zinc was detected 1.2X above the CRDL in the field blank.	The zinc result for sample B02-43-2 was considered undetected.
MFGW06	Metals	Calcium, chromium, and sodium were detected below the CRDLs in the field blank.	The chromium and sodium in affected sample results are below the CRDL.
MFGW06	Metals	Iron, lead, and zinc were detected above the CRDLs in the rinsate blank.	The user needs to evaluate the associated sample results for possible contamination.
MFGW06	Metals	Barium, calcium, chromium, magnesium, manganese, and sodium were detected below CRDLs in the rinsate blank.	The user needs to evaluate the associated sample results for possible contamination.
MFGY51	Metals	Replicate ICP readings ere inconsistent for arsenic results.	The arsenic result for samples D07-51-1, D17-51-1, D24-51-1, D25-51-1, D28-51-1, D29-51-1, and D30-51-1 have been qualified as estimated.
G42501	Metals	Matrix spike recovery for arsenic was 53.3%.	All arsenic results have been qualified as estimated low bias.
G42501	Metals	The difference between FAA laboratory duplicate results exceeded the QC limit.	Lead results for samples G42-501, G42-502, G42-503, G42-504, G42-505, and G42-506 have been qualified as estimated.

SECTION 4
SOURCE CHARACTERIZATION

The sampling activities and analytical results associated with source characterization are summarized in this section of the report. The sampling activities and related analytical results applicable to the evaluation of the migration and exposure pathways are summarized in the subsequent pathway sections of the report.

4.1 SOURCE SAMPLING

WESTON collected sludge samples at six sample stations (P01 through P06) in an effort to characterize and document the presence of hazardous substances associated with Pits 1 through 3. The prefix "P" was assigned to the respective station number of each sludge sample. A blind field duplicate sample was collected at station P05 for QA/QC. The ESI sample stations are shown on Figure 3-1, and the sample stations, descriptions, and rationales are summarized in Table 3-2.

Within the pit berms, a strong naphthalene odor was discernible to the WESTON field team. Based on field screening for organic vapors, breathing zone concentrations exceeded site-specific health and safety plan action levels. Therefore, the pit sludge sampling was conducted in Level C personal protective equipment, which includes a full-face respirator. The sludge samples were collected from a depth range of 2 to 3 feet bgs using a hand auger, and the samples appeared dark brown with an oily consistency (Reference 4). Based on this information, WESTON EMI was advised that the samples would be designated as high concentration.

4.2 SOURCE ANALYTICAL RESULTS

The analytical data available to characterize Pits 1 through 3 are summarized in the following subsections.

4.2.1 Analytical Results from Previous Investigations

As part of the 1994 SIP, WESTON collected surface soil samples near Pits 1 through 4. Among the constituents detected at elevated concentrations were 2-methylnaphthalene (47 mg/kg), naphthalene (11 mg/kg), phenanthrene (8.8 mg/kg), chrysene (1.2 mg/kg), fluorene (5.1 mg/kg), barium (18,000 mg/kg), chromium (527 mg/kg), and lead (632 mg/kg) (Reference 12).

4.2.2 ESI Analytical Results

The analytical results for the pit constituents exceeding background comparison values are presented in Table 4-1. The results indicate elevated BNA concentrations of 2-methylnaphthalene (470 mg/kg), naphthalene (160 mg/kg), and phenanthrene (110 mg/kg). VOC contamination consisted of ethylbenzene (9.0 mg/kg), toluene (7.4 mg/kg), and total xylenes (59 mg/kg). Metals analyses indicate elevated concentrations of chromium (709 mg/kg), lead (952 mg/kg), and zinc (2,160 mg/kg). Barium was also detected (11,400 mg/kg), but did not exceed the background comparison value.

It should be noted that elevated levels of several additional BNAs were detected in the pit sludge samples. However, they do not appear in Table 4-1 because the concentrations fell below the relatively high quantitation limits. The analytes include acenaphthene (21 mg/kg), anthracene (22 mg/kg), dibenzofuran (25 mg/kg), and fluorene (46 mg/kg).

Of the detected hazardous substances, the highest concentrations can be attributed to 2-methylnaphthalene, naphthalene, and phenanthrene; each a member of the polycyclic aromatic hydrocarbon (PAH) family of chemicals, and barium. PAHs are known to be relatively immobile in soil because of their low water solubility and are generally persistent in the environment.. High levels of barium were found on-site in the groundwater and drainage ditch samples (discussed in Sections 5 and 6), however, barium was not found above background comparison values in the pit samples. Barium, as barium sulfate (barite), is commonly used as an oil field drilling mud. As previously discussed in Subsection 2.1.3, the pits were used to dispose of waste oil and oil field drilling material.

Because of their high levels in on-site samples, total PAH and barium were chosen as indicator contaminants to help evaluate the extent of migration. WESTON tabulated the total PAH and barium concentrations for each soil, sludge, and sediment sample collected for the ESI. Figures 3-1 and 3-2 show each of the sample station locations for the ESI and the corresponding total PAH and barium results in mg/kg.

4.3 SOURCE QUANTITY

As mentioned previously, WESTON collected depth measurements from the pits during ESI field activities. Pits 1 and 2 were approximately 6.5 feet deep at a distance of 10 feet from the western edge. Because of the instability of the surface, a measurement from Pit 3 could not be made. The sludge thickness near the center of the pits is not known. In order to estimate the source volume, a uniform depth of 6.5 feet for each pit is assumed. The resulting source volumes are as follows:

- Pit 1: 125 feet x 150 feet x 6.5 feet = 121,875 cubic feet
- Pit 2: 400 feet x 150 feet x 6.5 feet = 390,000 cubic feet
- Pit 3: 325 feet x 150 feet x 6.5 feet = 316,875 cubic feet

These figures sum to an estimated total source volume of 828,750 cubic feet or 30,695 cubic yards. However, since the pit depths away from the edges are not known, it is likely that the aggregate pit volume exceeds this estimate.

4.4 SOURCE CHARACTERIZATION SUMMARY

WESTON collected 6 sludge samples at the Delta Shipyard site during the week of 22 July 1996. The samples consisted of two samples each from Pits 1 through 3. The analytical results indicate the presence of high concentrations of several VOCs, PAHs, and metals. The aggregate volumetric extent of contaminated sludge is estimated to be 31,000 cubic yards. During the site reconnaissance in March 1996, field screening did not reveal the presence of organic vapors. However, during sampling activities, the results of field screening within the pit berms indicated that the organic vapors in the breathing zone represent a potential human health hazard. Based on the laboratory analytical results, high levels of hazardous constituent contamination occur consistently throughout the pit samples.

Table 4-1
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Waste Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	P01 P01-71-1 07/25/96 Normal 2.0'-3.0'	P02 P02-71-1 07/25/96 Normal 2.0'-3.0'	P03 P03-71-1 07/25/96 Normal 2.0'-3.0'	P04 P04-71-1 07/25/96 Normal 2.0'-3.0'	P05 P05-71-1 07/25/96 Normal 2.0'-3.0'
Volatile Organics								
Ethylbenzene (ug/kg)	ND	------		8700	3500	4500	660 J	8600
Toluene (ug/kg)	ND	------		2300 U	2100 U	3800	1700 U	6400
Xylenes (total) (ug/kg)	ND	------		27000	23000	28000	2000	56000
Semi-Volatile Organics								
2-Methylnaphthalene (ug/kg)	ND	------		390000	460000	470000	130000	410000
Naphthalene (ug/kg)	ND	------		130000	160000	160000	48000 J	130000
Phenanthrene (ug/kg)	32	96		91000 J	100000 J	110000 J	90000 U	61000 J C-BSQL
Pesticides								
Endosulfan II (ug/kg)	ND	------		84	88	89	44 U	62 U
Heptachlor epoxide (ug/kg)	ND	------		110	49	89	22 U	31 U
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Arsenic (mg/kg)	7.7	23.1		26.1	32.7	27.6	48.2	61.2
Cadmium (mg/kg)	ND	------		5.6	6.5	5.1	3.5	12.2
Chromium (mg/kg)	18.5	55.5		709	576	520	104	371
Cyanide (mg/kg)	ND	------		1.1	1.4	0.65	0.54 U	0.82 U
Lead (mg/kg)	117	351		861	952	771	520	561
Mercury (mg/kg)	ND	------		1.8	1.6	1.2	0.98	0.81
Sodium (mg/kg)	164	492		1330	1360	1980	1590	1200
Zinc (mg/kg)	206	618		1010	1140	1020	808	2160

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 4-1 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Waste Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	P05 P05-72-1 07/25/96 Duplicate 2.0'-3.0'	P06 P06-71-1 07/25/96 Normal 2.0'-3.0'	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Volatile Organics								
Ethylbenzene (ug/kg)	ND	------		9000	1300 J			
Toluene (ug/kg)	ND	------		7400	2400 U			
Xylenes (total) (ug/kg)	ND	------		59000	13000			
Semi-Volatile Organics								
2-Methylnaphthalene (ug/kg)	ND	------		470000	300000 J			
Naphthalene (ug/kg)	ND	------		160000	90000 J			
Phenanthrene (ug/kg)	32	96		79000 J C-BSQL	53000 J C-BSQL			
Pesticides								
Endosulfan II (ug/kg)	ND	------		56 U	65 U			
Heptachlor epoxide (ug/kg)	ND	------		28 U	78			
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Arsenic (mg/kg)	7.7	23.1		48.9	16.4			
Cadmium (mg/kg)	ND	------		15.2	6.2			
Chromium (mg/kg)	18.5	55.5		384	451			
Cyanide (mg/kg)	ND	------		0.68 U	0.96 U			
Lead (mg/kg)	117	351		525	345			
Mercury (mg/kg)	ND	------		0.76	0.85			
Sodium (mg/kg)	164	492		1070	464			
Zinc (mg/kg)	206	618		2500	1190			

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

SECTION 5
GROUNDWATER PATHWAY

A discussion of the groundwater pathway, one of four major pathways of potential hazardous waste migration assessed in this report, is provided in this section. The discussion focuses on the aquifer characteristics of the region, the likelihood of a release of hazardous substances to groundwater, and the potential targets of hazardous waste migration through the groundwater pathway.

5.1 HYDROGEOLOGIC SETTING

This subsection presents important factors related to the geologic framework and groundwater conditions at the site.

5.1.1 Geologic Framework

Quaternary-age natural levees deposited by the Mississippi River are present at the surface of the Delta Shipyard site. Regionally, the levees typically form a thin mantle of sand, silt, and clay restricted to stream valleys and coastal areas (Reference 13). Locally, the natural levees are composed of gray and brown silt, silty clay, and limited amounts of fine-grained sand (Reference 14). The thickness of the levees at the site is not known.

Quaternary-age alluvium deposited by the Mississippi River underlies the natural levees and is composed of sand and gravel near the base, then, becomes progressively finer grained toward the top of the deposits (Reference 13). Near the top of the alluvium, the deposits are composed of gray-to-brownish gray clay (Reference 14). The alluvial deposits throughout the state range in thickness from less than 50 feet in central and northern Louisiana to more than 3,500 feet in the southeastern coastal areas. Based on available geologic maps, the alluvium thickness in the Houma area is approximately 2,500 feet.

Boring logs from two 50-foot soil borings completed during the 1980 investigation indicate the presence of silt and clay throughout the boring interval. Samples of clay in the 0- to 15-foot range were sent to a geotechnical laboratory and were found to have permeabilities ranging from 10^{-7} cm/sec to 10^{-8} cm/sec (Reference 8). During ESI field activities, WESTON completed shallow soil borings at stations B01 and B02 on the east side of Pits 2 and 3 (see Figure 3-1). The borings were completed to depths of 16 and 24 feet, respectively. Sandy-to-silty clay was found throughout the depth interval of each soil boring (Reference 15).

5.1.2 Groundwater Conditions

The alluvium is recharged primarily from rainfall. Streams flowing across the alluvium are effluent (i.e., are recharged by groundwater) during most of the year, and groundwater discharge makes a significant contribution to the base flow of these streams. The hydraulic gradient near the streams is reversed during high-water stages, and the streams become influent (i.e., recharge groundwater) for brief periods. However, on a yearly basis, the movement of groundwater in the alluvium is generally effluent toward the major streams.

Throughout the state, yields of wells completed at the base of the alluvium are generally high. However, the occurrence of fresh groundwater is irregular near the site (Reference 13) and shallow groundwater is not used for drinking in Houma because of its high salt content (Reference 16). Groundwater, however, is used for industrial purposes in the site vicinity. (Reference 17).

5.2 LIKELIHOOD OF RELEASE

Important factors related to the likelihood of a release from a source of hazardous substances at the site to groundwater are presented in this section.

5.2.1 Depth to Groundwater

The depth to shallow groundwater at the site is approximately 4 to 8 feet bgs based on ESI geoprobe borings (Reference 14).

5.2.2 Depth of Contamination

The depth of groundwater contamination at the site is approximately 4 to 8 feet bgs based on groundwater analytical data resulting from ESI field activities. Refer to Subsection 5.2.7 for additional information.

5.2.3 Net Precipitation

Net precipitation is equivalent to total annual precipitation less potential evapotranspiration. The mean annual precipitation in the site vicinity is approximately 64.68 inches (Reference 18). WESTON calculated an annual net precipitation of 22.80 inches, accounting for potential evapotransportation, using the Thornthwaite method (References 19 and 20).

5.2.4 Thickness of Impermeable Layers

Based on available boring logs, an impermeable layer between the surface and shallow groundwater has not been identified.

5.2.5 Hydraulic Conductivity of Impermeable Layer

The existence of an impermeable layer between the surface and groundwater has not been determined. Therefore, a hydraulic conductivity value cannot be assigned. However, previous testing of the near surface soils have resulted in low permeabilities in the 10^{-7} to 10^{-8} cm/sec range that reduces the vertical movement of shallow groundwater (Reference 7).

5.2.6 Analytical Results from Previous Investigations

During the 1980 investigation, two shallow groundwater monitoring wells were installed near the two closed pits, to depths of 13 and 20 feet bgs (Reference 8). However, there is no available information indicating that any groundwater investigations have been conducted at the site.

5.2.7 ESI Groundwater Sampling and Analytical Results

WESTON collected soil and groundwater samples at shallow boring stations B01 and B02 in an effort to document the migration of hazardous substances associated with Pits 1 through 3. The borings are located in an approximate 100-foot wide strip of land between the pits and the Company Canal. Due to the extremely dense vegetation, a bulldozer was used to create a vehicle-accessible path to the boring locations. The prefix "B" was assigned before the respective station number of each boring soil and groundwater sample. A blind field duplicate soil sample was collected at station B01 for QA/QC. Following sampling at each boring, the boreholes were sealed using hydrated bentonite pellets. The ESI boring sample stations are shown in Figure 3-1.

The borings at stations B01 and B02 were completed to depths of 16 feet and 24 feet, respectively. Based on the results of field screening for organic vapors and observed soil staining, soil samples from each boring were collected from areas of evident contamination. At the terminal depth of each boring, one groundwater sample was collected using dedicated tygon tubing connected to a peristaltic pump. The groundwater and soil boring analytical results that exceed background comparison values are presented in Tables 5-1 and 5-2. The data indicates that subsurface soil and groundwater are contaminated with pit-related hazardous constituents with especially high levels at station B01.

Elevated groundwater concentrations of 2-methylnaphthalene (65 micrograms per liter [µg/L]), naphthalene (23 µg/L), phenanthrene (9 µg/L), barium (29,400 µg/L), chromium (507 µg/L), lead (482 µg/L), and zinc (3,290 µg/L) were found at station B01. Each of these analytes was also found in the pit sludge samples at elevated concentrations.

Soil boring duplicate samples B01-51-1 and B01-52-1 were collected at a depth of 2 feet bgs and found to contain 2-methylnaphthalene (11 mg/kg), naphthalene (2.4 mg/kg), phenanthrene (6.6 mg/kg), and pyrene (1.7 mg/kg). B01-51-2 was collected at a depth of 10 feet bgs, site-related constituents were not found at concentrations exceeding background comparison levels.

5.3 GROUNDWATER PATHWAY TARGETS

The potential receptors, or targets, of the groundwater pathway include the population and resources that rely on local aquifers as a source of water supply. The targets identified for the groundwater pathway are discussed in the following sections.

5.3.1 Nearest Well

WESTON contacted the Louisiana Department of Transportation and Development (LDTD) in Baton Rouge, Louisiana, to obtain a listing of active groundwater wells in the site vicinity. LDTD provided WESTON with water well information describing ownership, location, use, and depth for all registered groundwater wells within a 4-mile radius of the site (Reference 17). Based on this information, there are no drinking water wells located within 4 miles of the site. The City of Houma receives potable water from an intake located along the Houma Navigational Canal. This intake is further discussed in Section 6, the Surface Water Pathway.

5.3.2 Well Head Protection Areas

No Well Head Protection Areas (WHPAs) are known to exist in the site vicinity.

5.3.3 Groundwater Resources

Resources associated with the groundwater pathway may include irrigation, watering of commercial livestock, commercial food preparation, commercial aquaculture, and water recreation. No uses for groundwater, which would constitute a resource, have been identified.

5.4 GROUNDWATER PATHWAY SUMMARY

Significant shallow groundwater contamination at the Delta Shipyard site has been documented. However, the extent of contamination between the pits and the Company Canal is not known because of the limited scope of the ESI groundwater sampling. There are no drinking water wells located within 4 miles of the site, and groundwater is not used as a resource in the area. As such, this pathway is of minimal concern. However, based on the analytical results and the proximity of the pits to the adjacent Company Canal, the potential exists for the discharge of site-contaminated groundwater to surface water. This scenario will be further discussed in Section 6, the Surface Water Pathway.

It should be noted that the focus of the ESI has been on surface or near surface conditions at Pits 1 through 3 based on the absence of surface containment. Subsurface (i.e., groundwater) conditions were of low concern because of the low subsurface soil permeability. The high degree of groundwater contamination discovered near Pits 1 through 3 during the ESI raises questions about the groundwater quality near Pit 4. Pit 4 is overgrown with grass, but soil samples collected in the upper two feet during the 1994 WESTON SIP indicated elevated concentrations of barium (18,900

mg/kg) and zinc (666 mg/kg). The absence of chemical data to characterize subsurface hazardous constituent concentrations between Pit 4 and Bayou La Carpe appears to be an emerging data gap.

Table 5-1
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Groundwater Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations				
	Maximum Background	3 Times Maximum Background	B01 B01-21-1 07/24/96 Normal	B02 B02-21-1 07/24/96 Normal	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Volatile Organics							
No Parameters Above Background							
Semi-Volatile Organics							
2-Methylnaphthalene (ug/l)	ND	-------	65	10 U			
Naphthalene (ug/l)	ND	-------	23	10 U			
Phenanthrene (ug/l)	ND	-------	9 J	1 J			
Pesticides							
No Parameters Above Background							
Polychorinated Biphenyls							
No Parameters Above Background							
Metals							
Arsenic (ug/l)	6	18	77.9	26.3			
Barium (ug/l)	139	417	29400	2290			
Cadmium (ug/l)	ND	-------	18.7	4.1 L			
Calcium (ug/l)	22900	68700	308000	194000			
Chromium (ug/l)	ND	-------	507	343			
Iron (ug/l)	2000	6000	206000	48000			
Lead (ug/l)	ND	-------	482	127			
Sodium (ug/l)	11600	34800	281000	247000			
Zinc (ug/l)	40	120	3290	627			

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 5-2
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Soil Boring Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	B01 B01-51-1 07/24/96 Normal 2.0'-3.0'	B01 B01-52-1 07/24/96 Duplicate 2.0'-3.0'	B01 B01-51-2 07/24/96 Normal 10.0'-11.0'	B02 B02-51-01 07/24/96 Normal 8.0'-9.0'	B02 B02-51-02 07/24/96 Normal 19.0'-20.0'
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
2-Methylnaphthalene (ug/kg)	ND	------		11000	5700 J	240 J C-BSQL	630 U	650 U
Naphthalene (ug/kg)	ND	------		2400 J	30000 U	820 U	630 U	650 U
Phenanthrene (ug/kg)	32	96		5700	6600 J	93 J	630 U	650 U
Pyrene (ug/kg)	52	156		1700 J	30000 U	820 U	630 U	650 U
Pesticides								
Endosulfan II (ug/kg)	ND	------		36	49	8.4 U	6.2 U	6.6 U
Heptachlor epoxide (ug/kg)	ND	------		12	19	4.2 U	3.1 U	3.3 U
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Mercury (mg/kg)	ND	------		0.09 U	0.08 U	0.1 U	0.09	0.07 U
Sodium (mg/kg)	164	492		6860	5870	2440	1290	2600

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 5-2 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Soil Boring Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	B02 B02-51-03 07/24/96 Normal 22.0'-23.0'	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
2-Methylnaphthalene (ug/kg)	ND	------		790 U				
Naphthalene (ug/kg)	ND	------		790 U				
Phenanthrene (ug/kg)	32	96		790 U				
Pyrene (ug/kg)	52	156		790 U				
Pesticides								
Endosulfan II (ug/kg)	ND	------		7.8 U				
Heptachlor epoxide (ug/kg)	ND	------		3.9 U				
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Mercury (mg/kg)	ND	------		0.11 U				
Sodium (mg/kg)	164	492		3890				

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

SECTION 6
SURFACE WATER PATHWAY

Surface water is the second of four pathways of potential hazardous waste migration assessed for the site. A discussion of the surface water draining the site, the probable point of entry (PPE) for a hazardous substance from the site to enter surface water, the likelihood of a release, and the potential targets of the pathway is presented in this section.

6.1 HYDROLOGIC SETTING

The City of Houma is situated near the confluence of several sizable streams including the Gulf Intracoastal Waterway, the Houma Navigational Canal, Bayou La Carpe, and Bayou Black. The Intracoastal Waterway and the Houma Navigational Canal receive frequent barge traffic related to area industry. Refer to Figure 6-1 for a schematic of the surface water bodies in the site vicinity.

On a more local scale, water at the site flows on the surface and in the subsurface, enters surface water at the PPE, and flows downstream. These segments of the surface water pathway are discussed in the following sections.

6.1.1 Overland Flow Segment

It appears that the on-site drainage ditch originates somewhere near the northeastern edge of Pit 1, but it is difficult to determine because of the thickness of the site vegetation. Near the northwest corner of Pit 1, the ditch turns south and runs along the western edge of Pits 1 through 3 for approximately 1,000 feet. Near the southwestern corner of Pit 3, the drainage ditch turns east and runs along the southern edge of Pit 3 for approximately 300 feet before discharging through a pipe to the Company Canal located immediately east of the site. There is an overflow pipe from Pit 2, which is known to have discharged to the drainage ditch as recently as 1994; however, during the ESI site visits, the overflow pipe was plugged.

6.1.2 Groundwater to Surface Water Segment

As discussed previously in Subsection 5.2.7, elevated levels of pit-related contaminants were found in both soil and groundwater samples at sample station B01. The soil samples were collected at depths of 2 and 10 feet bgs. The analytical results of the 2 foot sample indicated considerable VOC, PAH, and metals contamination. Analyses of the groundwater sample collected at B01 indicates elevated levels of PAHs and metals, especially barium (29,400 mg/L). It is not clear if the groundwater levels are below or above the water level in the Company Canal. However, groundwater discharge to surface water is a common occurrence in the Houma area, and station

B01 is located approximately 50 feet from the Company Canal. Based on this information, groundwater to surface water discharge of site-related contaminants is suspected at the site.

6.1.3 Probable Point of Entry

The PPE for a release of hazardous substances from sources at the site to perennial-flowing surface water body potentially occurs at the Company Canal. The PPE occurs after approximately 850 feet of overland flow (measured from the Pit 2 overflow pipe) at the confluence of the drainage ditch and the Company Canal. However, there are potentially additional PPEs based on the likely scenario of groundwater to surface water discharge along the western bank of the Company Canal.

6.1.4 Surface Water Flow Path

From the PPE, water in the Company Canal flows south for approximately 1,000 feet until reaching Bayou La Carpe. Bayou La Carpe flows south approximately 3,500 feet to its confluence with the Houma Navigational Canal. After approximately 60 miles, the Houma Navigational Canal discharges to the Gulf of Mexico. Surface water flow in all of the water bodies in the Houma area generally follow this trend of southward flow. Approximately 10 miles south of Houma, the elevation of the Houma Navigational Canal is equal to sea level. Flow velocity at this point is very slow or stagnant and flow direction is determined by the wind direction and tidal stage (Reference 18).

During periods of sustained southeast winds, Bayou La Carpe, the Houma Navigational Canal, and the Intracoastal Waterway become tidally influenced, resulting in considerable northward flow (Reference 21). Saltwater intrusion in the Intracoastal Waterway has been known to extend nearly as far as New Orleans, Louisiana (Reference 4). During the ESI sampling visit, surface water flow in Bayou La Carpe and the Company Canal was to the south, and flow in the Intracoastal Waterway was to the northeast. The surface water velocity in the Houma Navigational Canal was too low to determine the flow direction. However, because of the unusual flow patterns in the site area, targets both downstream and upstream of the site could potentially be impacted by a release of site-related hazardous substances to surface water. Out of the myriad of different potential surface water flow paths, this investigation focused on three scenarios which could impact the highest number of targets. These flow paths (Flow Paths 1 through 3) are summarized in Table 6-1 and illustrated on Figures 6-2 and 6-3.

6.2 LIKELIHOOD OF RELEASE

Important factors related to the likelihood of a release from a source of hazardous substances at the site to surface water are presented in the following sections.

6.2.1 Distance to Surface Water

The shortest distance from a known or potential source of hazardous substances at the site to a perennial-flowing surface water body is approximately 850 feet. The distance is measured from the Pit 2 overflow pipe to the PPE.

6.2.2 Flood Frequency

Based upon flood plain maps obtained from the Federal Emergency Management Agency (FEMA), the site is located in a 100-year floodplain. In the event of a 100-year storm, the FEMA map indicates that the site would be subject to a base flood elevation of 5 feet (Reference 22). The resulting flooding from a storm of this magnitude could enable pit contaminants to overflow the berms.

6.2.3 2-Year 24-Hour Rainfall

The 2-year 24-hour rainfall for the area of the site is approximately 5.5 inches (Reference 23).

6.2.4 Flood Containment

In most areas, the perimeter of Pits 1 through 3 consists of a berm that stands approximately 2 feet above freeboard. However, there are two areas of potential concern. The berm is absent in a low lying area in the northeastern section of Pit 1 at the apparent location of the beginning of the on-site drainage ditch. The second area of concern is the overflow pipe from Pit 2. At the time of the ESI field activities, the pipe was plugged. However, based on the results of field observations and analytical results from the 1994 WESTON SIP, there appears to have been historical discharge of contaminated water from Pit 2 to the drainage ditch.

6.2.5 Surface Water/Sediment Analytical Results from Previous Investigations

During the 1994 SIP, WESTON collected sediment samples from 3 locations in the on-site drainage ditch. The analytical results indicated the presence of elevated concentrations of benzo(a)anthracene (6.0 mg/kg), benzo(a)pyrene (4.1 mg/kg), benzo(b)fluoranthene (6.1 mg/kg), chrysene (5.3 mg/kg), fluoranthene (13.0 mg/kg), phenanthrene (5.0 mg/kg), pyrene (12.0 mg/kg), and barium (20,500 mg/kg).

6.2.6 ESI Sediment Sampling and Analytical Results

Based on the analytical results from the 1994 SIP, the contaminants of concern at the site appeared to be PAHs, with the exception of barium. As a general rule, PAHs have relatively low water solubilities and have a tendency to sorb to bottom sediment particles. Hence, the ESI stream sampling focused on the collection of bottom sediment samples. The ESI sediment sample stations

are shown in Figures 3-1 and 3-2. The sample stations, descriptions and rationales are summarized in Table 3-1.

In an effort to characterize the extent of contaminant migration in the surface water pathway, WESTON collected on-site drainage ditch and off-site stream bottom sediment samples during the ESI. The sediment samples were assigned the prefix "D" in front of their respective station numbers. Drainage ditch samples were collected at 4 sample stations (D01 through D04). The samples were collected from the top 6 inches of sediment using a disposable scoop. The depth of water in the ditch at the time of sampling ranged from 6 to 12 inches (Reference 4). Using a boat to access the stream sample stations, samples of the top 6 inches of sediment were collected at 29 sample stations (D05 through D34) using a bottom dredge sampler. Water depths ranged from 1.8 feet at station D05 to 21.7 feet at station D30 (Reference 4). In addition to field logbook documentation, the stream sediment locations were recorded using global positioning system (GPS) satellite technology. The resulting coordinates are accurate to a distance of plus or minus 3 feet. The stream sediment sample station geographic coordinates are presented in Appendix A.

The drainage ditch sediment analytical results are presented in Table 6-2. The findings indicate low levels of some pit constituents such as 2-methylnaphthalene (1.5 mg/kg), naphthalene (0.86 mg/kg), phenanthrene (1 mg/kg), chromium (232 mg/kg), and zinc (4,400 mg/kg). The results also include some contaminants that were not found above background comparison values in the pit samples. Among these are benzo(b)fluoranthene (1.1 mg/kg), benzo(k)fluoranthene (1.1 mg/kg), chrysene (1.4 mg/kg), fluoranthene (0.83 mg/kg), pyrene (0.73 mg/kg), and high levels of barium (22,500 mg/kg).

The stream sediment analytical results are presented in Table 6-3. For the most part, site-related contaminants did not show up in the off-site samples with the exception of barium. Barium was detected at the PPE (station D05) at a concentration of 20,100 mg/kg. The other samples within the same stream cross-section also recorded elevated levels of barium, D06 (26,300 mg/kg) and D07 (17,700 mg/kg). Approximately 1,000 feet downstream at the confluence of the Company Canal and Bayou La Carpe at stations D08 through D10, the barium levels are lower (ranging from 6,600 to 10,800 mg/kg). Barium concentrations exceeding background comparison values were not found in the other stream bottom samples with the exception of the Bayou La Carpe cross-section samples (D11 through D13). Barium was found at these stations at concentrations ranging from 8,120 mg/kg to 24,100 mg/kg. Based on the absence of groundwater characterization data near Pit 4 and the presence of numerous oil field drilling services business in the site vicinity, it is unclear if the barium levels found at stations D11 through D13 can be attributed to the Delta Shipyard site.

6.2.7 ESI Surface Water Sampling Analytical Results

Surface water samples were collected at three sample stations (W01 through W03) to determine if nearby drinking water intakes along the Intracoastal Waterway and Bayou Black have been

impacted by hazardous constituents. The surface water samples were assigned the prefix "W" in front of their respective station numbers.

The surface water analytical results are shown on Table 6-4. To evaluate drinking water conditions, a pretreatment sample (W02) and a post-treatment sample (W03) were collected at the Houma Water Plant. W02 was relatively contaminant-free with the exception of lead (9.7 µg/L). Several contaminants, however, were found in the posttreatment sample, W03. These include bromodichloromethane (31.9 µg/L), chloroform (89.9 µg/L), lead (4.5 µg/L), and zinc (565 µg/L). The occurrence of these constituents does not appear to be site attributable, and the concentrations are below current EPA drinking water maximum contaminant levels (Reference 24).

6.3 SURFACE WATER PATHWAY TARGETS

The potential targets of the surface water pathway include the population relying on surface water downstream of the PPE as a source of drinking water, as well as the downstream fisheries, sensitive environments, and surface water resources. The targets identified within the surface water pathway are discussed in the following sections.

6.3.1 Drinking Water Intakes

WESTON contacted Bryan Sampey, Manager of the City of Houma Water Plant, to obtain information regarding surface water intakes in the Houma area. The water supply for the City of Houma is drawn from an intake along the Houma Navigational Canal at the Houma Water Plant No. 3 (Figure 6-1). Depending on the flow path from the site, the intake is either located 2.35 or 2.55 stream miles from the site. During times of saltwater intrusion, water is drawn from intakes along Bayou Black near background surface water sample station W01 (Reference 25). The Bayou Black backup intakes are not within the surface water pathway for the site.

Prior to distribution to area residents, the water drawn from the intakes undergoes several stages of treatment at the Houma Water Plant No. 3 (Reference 4). Before reaching the intakes, the water must first pass through screens to remove coarse material (fish, sticks, trash, etc.). The water is then treated with potassium permanganate to improve taste and odor. Next, aluminum sulfate is added as a coagulant for colloid removal. After a specified detention time, the water passes through an activated carbon filter for suspended solids removal. Finally, the water is chlorinated prior to distribution to approximately 33,950 residents of Houma, Louisiana and the nearby communities of Dulac and Dularge (Reference 26).

6.3.2 Wetlands and Other Sensitive Environments

WESTON conducted a review of National Wetland Inventory maps to identify locations of wetlands potentially affected by the site (Reference 27). This information is detailed in Table 6-5.

The piping plover, brown pelican, bald eagle, and Kemp's ridley sea turtle are federal- and state-listed threatened/endangered species found in Terrebonne Parish. The habitats for these species represent sensitive environments. Based on information obtained from the U.S. Fish and Wildlife Service, the endangered/threatened species are not suspected to inhabit the immediate site area (Reference 28). The species and their respective habitats are listed in Table 6-6.

6.3.3 Fisheries

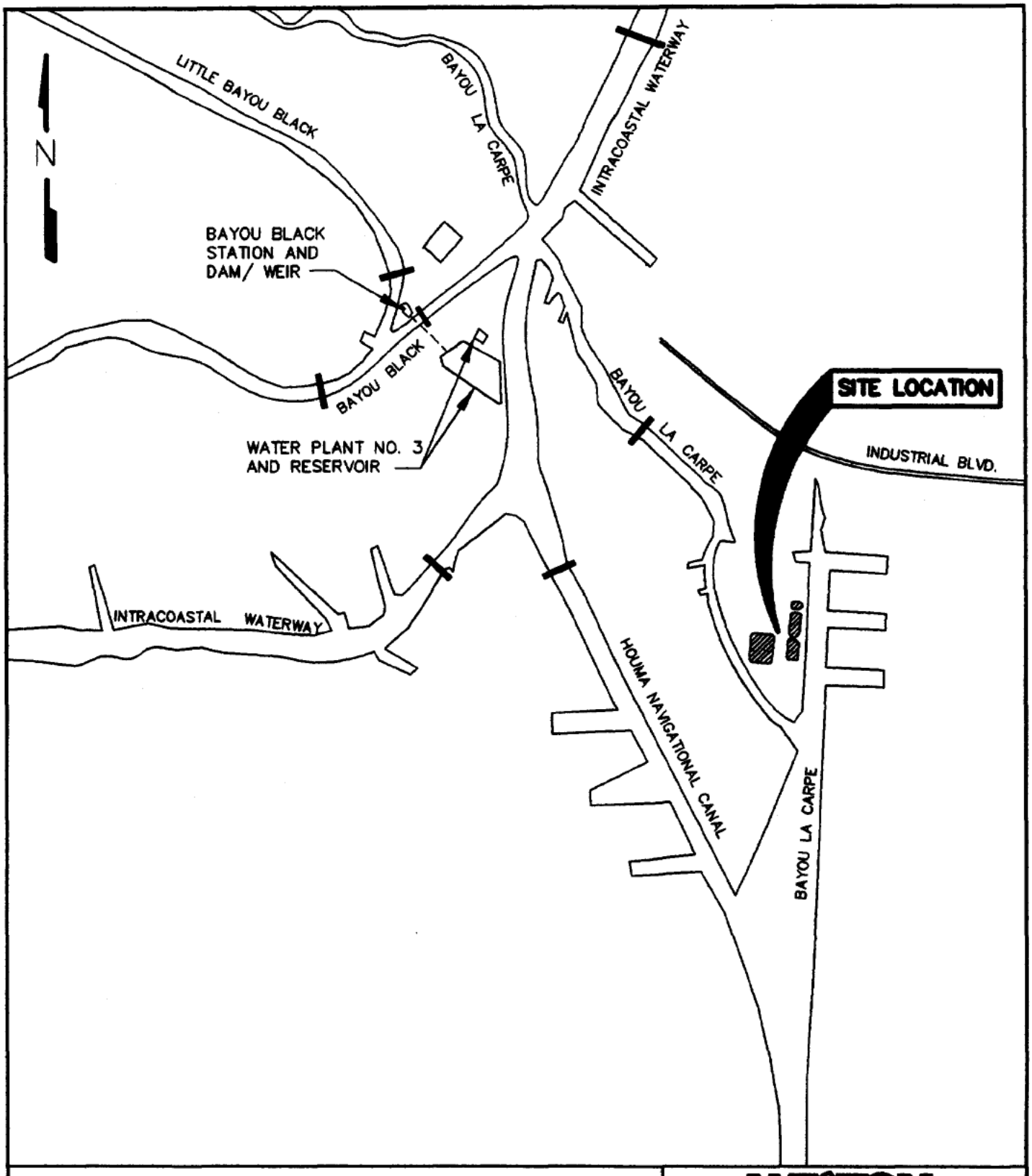
Commercial and recreational fishing occurs in the Intracoastal Waterway, the Houma Navigational Canal, and Bayou La Carpe in the site vicinity. In the absence of tides, surface water within 5 miles south of Houma, Louisiana is fresh. Further south, the water becomes brackish. Catfish, bass, and crabs are typically caught in the freshwater areas. In the brackish areas, redfish and flounder are the main catch. A local fishery specialist estimated an annual catch within 5 miles of Houma, Louisiana to be at or below 1,000 pounds; further south the estimate increases to 10,000 pounds annually (Reference 29). During ESI sampling activities, crab fishermen were observed emptying their cages at the confluence of the Houma Navigational Canal and Bayou La Carpe near sample station D26.

6.3.4 Resources

Resources associated with the surface water pathway may include irrigation, watering of commercial livestock, commercial food preparation, commercial aquaculture, and water recreation. Among the stream use designations for the Intracoastal Waterway, Houma Navigational Canal, and Bayou La Carpe are primary and secondary contact recreation. In addition, segments of the Intracoastal Waterway north of Houma are designated for irrigation use (Reference 30).

6.4 SURFACE WATER PATHWAY CONCLUSIONS

During the ESI, WESTON collected background and characterization drainage ditch sediment samples at 4 stations, stream bottom sediment samples at 30 stations, and surface water samples at 3 stations to evaluate the extent of site-related contaminant migration by surface water. The results generally indicate migration of site-related contaminants from the pits to the drainage ditch, into the Company Canal, and at least 1,000 feet downstream of the PPE. A drinking water intake, fisheries, and wetlands are located within 15 stream miles of the PPE. Analytical sampling from the drinking water intake indicates that water is unaffected by releases from the site. However crab fishermen were observed during the ESI approximately 3,000 feet south of the farthest documented downstream point of site-related stream sediment contamination. Based on the occurrence of elevated levels of PAHs and barium in the groundwater and drainage ditch sediment samples collected on-site, releases to surface water are probably continuing.



LEGEND:

BRIDGE

0 1000 2000

SCALE IN FEET

WESTON

FIGURE 6-1

STREAM LOCATION MAP

DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419

EPA REGION VI
ARCS EXPANDED SITE INSPECTION

W.O. NO. : 04603-026-031-0300

H:\ARCS\ARC2631\0300C.PA.JC 1=1 11-07-96 (PCP=ARCS)

TABLE 6-1
SURFACE WATER FLOW PATH SUMMARY

Stream Segment	Distance From a Source Area	Distance From PPE	Estimated Flow Rate and Direction
Flow Path 1			
Company Canal at PPE to the Bayou LaCarpe	0.2 mile	0	100 to 1,000 CFS; south
Bayou LaCarpe at the Company Canal confluence to the Houma Navigation Canal	0.4 mile	0.2 mile	100 to 1,000 CFS; south
Houma Navigation Canal at the Bayou LaCarpe confluence, south to the end of the 15-mile TDL	1.1 miles	0.9 mile	1,000 to 10,000 CFS; south
Flow Path 2			
Company Canal at PPE to the Bayou LaCarpe	0.2 mile	0	100 to 1,000 CFS; south
Bayou LaCarpe at the Company Canal confluence south to the Houma Navigation Canal	0.4 mile	0.2 mile	100 to 1,000 CFS; south
Houma Navigational Canal at the Bayou La Carpe confluence north to the Intracoastal Waterway	1.1 miles	0.9 miles	1,000 to 10,000 CFS; north
Intracoastal Waterway at the Houma Navigational Canal confluence, north to the end of the 15-mile TDL	2.4 miles	2.2 miles	1,000 to 10,000 CFS; north, then southeast
Flow Path 3			
Company Canal at PPE to the Bayou LaCarpe	0.2 mile	0	100 to 1,000 CFS; south
Bayou LaCarpe at the Company Canal confluence north to the Intracoastal Waterway	0.4 mile	0.2 mile	100 to 1,000 CFS; north
Intracoastal Waterway at the Houma Navigational Canal confluence, north to the end of the 15-mile TDL	2.1 miles	1.9 miles	1,000 to 10,000 CFS; north, then southeast

Table 6-2
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Drainage Ditch Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D01 D01-51-1 07/26/96 Normal 0.0'-0.5'	D02 D02-51-1 07/26/96 Normal 0.0'-0.5'	D02 D02-52-1 07/26/96 Duplicate 0.0'-0.5'	D03 D03-51-1 07/26/96 Normal 0.0'-0.5'	D03 D03-52-1 07/26/96 Duplicate 0.0'-0.5'
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
2-Methylnaphthalene (ug/kg)	ND	------		780 U	1500 J	730 UJ	750 U	760 U
Anthracene (ug/kg)	ND	------		120 J C-BSQL	800 U	300 J C-BSQL	81 J C-BSQL	100 J C-BSQL
Benzo(b)fluoranthene (ug/kg)	53	159		540 J C-BSQL	660 J C-BSQL	1100 J^	200 J C-BSQL	390 J C-BSQL
Benzo(k)fluoranthene (ug/kg)	ND	------		510 J C-BSQL	580 J C-BSQL	1100 J^	210 J C-BSQL	410 J C-BSQL
Carbazole (ug/kg)	ND	------		780 U	800 U	730 U	750 U	760 U
Chrysene (ug/kg)	83	249		180 J	470 J C-BSQL	230 J	92 J	98 J
Fluoranthene (ug/kg)	68	204		320 J C-BSQL	590 J C-BSQL	220 J C-BSQL	82 J	89 J
Naphthalene (ug/kg)	ND	------		780 U	860 J	730 UJ	750 U	760 U
Phenanthrene (ug/kg)	32	96		240 J C-BSQL	880 J	81 J	750 U	760 U
Pyrene (ug/kg)	52	156		580 J C-BSQL	730 J	450 J C-BSQL	120 J	160 J C-BSQL
Pesticides								
No Parameters Above Background								
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Barium (mg/kg)	4920	14760		11200	20500	22500	11600	20200
Cadmium (mg/kg)	ND	------		1.1 L	2.2 L	1.6 L	0.43 L	0.56 L
Chromium (mg/kg)	18.5	55.5		75.2	123	92.1	44.2	68.4
Sodium (mg/kg)	164	492		964 LJ^	698 LJ^	726 LJ^	326 LJ^	519 LJ^

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-2 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Drainage Ditch Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D01 D01-51-1 07/26/96 Normal 0.0'-0.5'	D02 D02-51-1 07/26/96 Normal 0.0'-0.5'	D02 D02-52-1 07/26/96 Duplicate 0.0'-0.5'	D03 D03-51-1 07/26/96 Normal 0.0'-0.5'	D03 D03-52-1 07/26/96 Duplicate 0.0'-0.5'
Metals								
Zinc (mg/kg)	206	618		2350	4400 J	459 J	407	287

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-2 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Drainage Ditch Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D04 D04-51-1 07/26/96 Normal 0.0'-0.5'	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
2-Methylnaphthalene (ug/kg)	ND	------		1900 U				
Anthracene (ug/kg)	ND	------		1500 J				
Benzo(b)fluoranthene (ug/kg)	53	159		680 J C-BSQL				
Benzo(k)fluoranthene (ug/kg)	ND	------		670 J C-BSQL				
Carbazole (ug/kg)	ND	------		1200 J				
Chrysene (ug/kg)	83	249		1400 J				
Fluoranthene (ug/kg)	68	204		830 J				
Naphthalene (ug/kg)	ND	------		1900 U				
Phenanthrene (ug/kg)	32	96		1000 J				
Pyrene (ug/kg)	52	156		620 J C-BSQL				
Pesticides								
No Parameters Above Background								
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Barium (mg/kg)	4920	14760		15400				
Cadmium (mg/kg)	ND	------		0.68 U				
Chromium (mg/kg)	18.5	55.5		232				
Sodium (mg/kg)	164	492		623 UJ				

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-2 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
On-Site Drainage Ditch Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D04 D04-51-1 07/26/96 Normal 0.0'-0.5'	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Metals								
Zinc (mg/kg)	206	618		459				

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-3
Delta Shipyard (CERCLIS ID LAD058475419)
Stream Sediment Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D05 D05-51-1 07/23/96 Normal 0.0'-0.5'	D05 D05-52-1 07/23/96 Duplicate 0.0'-0.5'	D06 D06-51-1 07/23/96 Normal 0.0'-0.5'	D07 D07-51-1 07/23/96 Normal 0.0'-0.5'	D08 D08-51-1 07/23/96 Normal 0.0'-0.5'
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
Fluoranthene (ug/kg)	550	1650		230 Jv	130 J	190 J	1100 U	820 U
Phenanthrene (ug/kg)	240	720		93 Jv	910 U	1200 U	1100 U	820 U
Pesticides								
No Parameters Above Background								
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Barium (mg/kg)	2060	6180		20100	18600	26300	17700	6600
Chromium (mg/kg)	57	171		146	142	123	62.1	70
Lead (mg/kg)	48.4	145.2		96.9	207	63.3	39.5	28.6
Zinc (mg/kg)	2130	6390		584	505	330	251	10200

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-3 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Stream Sediment Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D09 D09-51-1 07/23/96 Normal 0.0'-0.5'	D10 D10-51-1 07/23/96 Normal 0.0'-0.5'	D11 D11-51-1 07/23/96 Normal 0.0'-0.5'	D12 D12-51-1 07/23/96 Normal 0.0'-0.5'	D13 D13-51-1 07/23/96 Normal 0.0'-0.5'
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
Fluoranthene (ug/kg)	550	1650		1300 U	1100 U	820 J	1700	250 J
Phenanthrene (ug/kg)	240	720		1300 U	1100 U	620 J	1100 J	1100 U
Pesticides								
No Parameters Above Background								
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Barium (mg/kg)	2060	6180		10800	8130	24100	11100	8120
Chromium (mg/kg)	57	171		109	72.1	38.9	146	34.9
Lead (mg/kg)	48.4	145.2		37.3	26.4	197	50.8	41.5
Zinc (mg/kg)	2130	6390		199	153	395	256	307

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-3 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Stream Sediment Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D19 D19-51-1 07/22/96 Normal 0.0'-0.5'	D20 D20-51-1 07/22/96 Normal 0.0'-0.5'	D23 D23-51-1 07/22/96 Normal 0.0'-0.5'	D25 D25-51-1 07/22/96 Normal 0.0'-0.5'	D27 D27-51-1 07/22/96 Normal 0.0'-0.5'
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
Fluoranthene (ug/kg)	550	1650		250 J	960 U	1000 U	180 J	1200 U
Phenanthrene (ug/kg)	240	720		160 J	960 U	1000 U	1400 U	1200 U
Pesticides								
No Parameters Above Background								
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Barium (mg/kg)	2060	6180		802	652	2570	836	2100
Chromium (mg/kg)	57	171		206	2400	187	704	940
Lead (mg/kg)	48.4	145.2		19	17.5	19.6	31.9	46.3
Zinc (mg/kg)	2130	6390		122	114	163	170	132

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-3 (Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Stream Sediment Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations					
	Maximum Background	3 Times Maximum Background	Station Sample Date QC Type Depth	D28 D28-51-1 07/22/96 Normal 0.0'-0.5'	D30 D30-51-1 07/22/96 Normal 0.0'-0.5'	D31 D31-51-1 07/22/96 Normal 0.0'-0.5'	Left Blank On Purpose	Left Blank On Purpose
Volatile Organics								
No Parameters Above Background								
Semi-Volatile Organics								
Fluoranthene (ug/kg)	550	1650		1200 U	1100 U	1300 U		
Phenanthrene (ug/kg)	240	720		1200 U	1100 U	1300 U		
Pesticides								
No Parameters Above Background								
Polychorinated Biphenyls								
No Parameters Above Background								
Metals								
Barium (mg/kg)	2060	6180		889	1130	690		
Chromium (mg/kg)	57	171		2990	1650	633		
Lead (mg/kg)	48.4	145.2		62.5	20.4	19		
Zinc (mg/kg)	2130	6390		194	114	149		

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

Table 6-4
Delta Shipyard (CERCLIS ID LAD058475419)
Drinking Water Surface Water Sampling Results Significantly Above Background Concentrations

Analyte	Background Concentration		Characterization Sample Concentrations				
	Maximum Background	3 Times Maximum Background	W02 W02-12-1 07/24/96 Duplicate	W03 W03-11-1 07/24/96 Normal	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Volatile Organics							
Bromodichloromethane (ug/l)	ND	------	2 U	31.9			
Chloroform (ug/l)	ND	------	2 U	89.9			
Dibromochloromethane (ug/l)	ND	------	2 U	11.5			
Semi-Volatile Organics							
No Parameters Above Background							
Pesticides							
No Parameters Above Background							
Polychorinated Biphenyls							
No Parameters Above Background							
Metals							
Lead (ug/l)	ND	------	9.7	4.5			
Zinc (ug/l)	40	120	20 U	565			

Shaded Values Exceed 3 Times Maximum Background Concentrations for Constituents Attributable to the Site.

TABLE 6-5
WETLANDS AND OTHER SENSITIVE ENVIRONMENTS

Stream Segment Name	Stream Segment Length	Wetland Frontage	Type of Environment
Flow Path 1			
Company Canal at PPE to the Bayou LaCarpe	0.2 mile	0.2 mile	PSS1S, PSS1As
Bayou LaCarpe at the Company Canal confluence south to the Houma Navigation Canal	0.7 mile	1.4 miles	PFO1As, PSS1Ch, PSS1Cs, PFO1C,
Houma Navigation Canal at the Bayou LaCarpe confluence, south to the end of the 15-mile TDL	14.1 miles	16.3 miles	PFO1As, PFO1R, PFO2T, PEM1T, PFO1Rs, PEM1V, PSS1T, E2EM1P, E2EM1N, PSS/3Rd, E2SS1/3P, PSS1Ch, E2SS1Ps, E2EM1N5, E2SS3Ps, E2SS3Ps6, E2EM1N6, E2EM1P6, PEM1Th, E2EM1P5, PEM1Ch
Flow Path 2			
Company Canal at PPE to the Bayou LaCarpe	0.2 mile	0.2 mile	PSS1S, PSS1As
Bayou LaCarpe at the Company Canal confluence south to the Houma Navigation Canal	0.7 mile	1.4 miles	PFO1As, PSS1Ch, PSS1Cs, PFO1C,
Houma Navigational Canal at the Bayou La Carpe confluence north to the Intracoastal Waterway	1.3 miles	1.7 miles	PFO1A, PSS1A, PFO1S, PFO1As
Intracoastal Waterway at the Houma Navigational Canal confluence, north to the end of the 15-mile TDL	12.8 miles	12.8 miles	PSS1R, PFO1A, PFO1As, PEM1C, PSS1A, PEM1F, PFO1C, PFO1Ad, PFO1Cd, PSS1C, PFO1Rs, PEM1R, PEM1T, PSS1T, PSS1Rs, PSS1Cs, PFO1Cs

TABLE 6-5 (Continued)
WETLANDS AND OTHER SENSITIVE ENVIRONMENTS

Stream Segment Name	Stream Segment Length	Wetland Frontage	Type of Environment
Flow Path 3			
Company Canal at PPE to the Bayou LaCarpe	0.2 mile	0.2 mile	PSS1S, PSS1As
Bayou LaCarpe at the Company Canal confluence north to the Intracoastal Waterway	1.7 miles	0.8 miles	PFO1As, PSS1S, PSS1R, PFO1A
Intracoastal Waterway at the Houma Navigational Canal confluence, north to the end of the 15-mile TDL	13.1 miles	14.0 miles	PFO1A, PFO1As, PEM1C, PSS1A, PEM1F, PSS1F, PFO1C, PFO1Ad, PFO1Cd, PSS1C, PFO1Rs, PEM1R, PEM1T, PSS1T, PSS1Rs, PFO1Rs, PSS1Cs, PFO1Cs, PFO1C

Reference 27

The type of environment is defined as follows:

PSS1S - Palustrine Scrub-shrub Broad-leaved Deciduous Temporary Tidal
PSS1As - Palustrine Scrub-shrub Deciduous Temporarily Flooded Spoil
PFO1As - Palustrine Forested Broad-leaved Deciduous Temporarily Flooded Spoil
PSS1Ch - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonally Flooded Diked/Impounded
PSS1Cs - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonally Flooded Spoil
PFO1C - Palustrine Forested Broad-leaved Deciduous Seasonally Flooded
PSS1R - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonal-tidal
PFO1A - Palustrine Forested Broad-leaved Deciduous Temporarily Flooded
PSS1A - Palustrine Scrub-shrub Broad-leaved Deciduous Temporarily Flooded
PFO1S - Palustrine Forested Broad-leaved Deciduous Temporary-tidal
PFO1R - Palustrine Forested Broad-leaved Deciduous Seasonal-tidal
PFO2T - Palustrine Forested Needle-leafed Deciduous Semipermanent-tidal
PEM1T - Palustrine Emergent Persistent Semipermanent-tidal
PFO1Rs - Palustrine Forested Broad-leaved Deciduous Seasonal-tidal Spoil
PEM1V - Palustrine Emergent Persistent Permanent-tidal
PSS1T - Palustrine Scrub-shrub Broad-leaved Deciduous Semipermanent-tidal
E2EM1P - Estuarine Intertidal Emergent Persistent Irregularly Flooded

TABLE 6-5 (Continued)
WETLANDS AND OTHER SENSITIVE ENVIRONMENTS

E2EM1N - Estuarine Intertidal Emergent Persistent Regularly Flooded
PSS1/3Rd - Palustrine Scrub-shrub Broad-leaved Deciduous/Broad-leafed Evergreen Seasonal-tidal Partially Drained/Diked
E2SS1/3P - Estuarine Intertidal Scrub-shrub Broad-leaved Deciduous/Broad-leafed Evergreen Irregularly Flooded
PSS1Ch - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonally Flooded Diked/Impounded
E2SS1Ps - Estuarine Intertidal Scrub-shrub Broad-leaved Deciduous Irregularly Flooded Spoil
E2EM1N5 - Estuarine Intertidal emergent Persistent Regularly flooded Mesohaline
E2SS3Ps - Estuarine Intertidal Scrub-shrub Broad-leaved Evergreen Irregularly flooded Spoil
E2SS3Ps6 - Estuarine Intertidal Scrub-shrub Broad-leaved Evergreen Irregularly Flooded Spoil Oligohaline
E2EM1N6 - Estuarine Intertidal Emergent Persistent Regularly Flooded Oligohaline
E2EM1P6 - Estuarine Intertidal Emergent Persistent Irregularly Flooded Oligohaline
PEM1Th - Palustrine Emergent Persistent Semipermanent-tidal Diked/Impounded
E2EM1P5 - Estuarine Intertidal Emergent Persistent Irregularly Flooded Mesohaline
PEM1Ch - Palustrine Emergent Persistent Seasonally Flooded Dike/Impounded
PEM1C - Palustrine Emergent Persistent Seasonally Flooded
PEM1F - Palustrine Emergent Persistent Semipermanently Flooded
PSS1F - Palustrine Scrub-shrub Broad-leaved Deciduous Semipermanently Flooded
PFO1Ad - Palustrine Forested Broad-leaved Deciduous Temporarily Flooded Partially Drained/Ditched
PFO1Cd - Palustrine Forested Broad-leaved Deciduous Seasonally Flooded Spoil
PSS1C - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonally Flooded
PEM1R - Palustrine Emergent Persistent Seasonal-tidal
PSS1Rs - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonal-tidal Spoil
PSS1Cs - Palustrine Scrub-shrub Broad-leaved Deciduous Seasonally Flooded Spoil
PFO1Cs - Palustrine Forested Broad-leaved Deciduous Seasonally Flooded Spoil

TABLE 6-6
ENDANGERED SPECIES

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS	HABITAT
Bird	Bald Eagle	*Haliacetus leucocephalus*	Threatened	Nest primarily in cypress snags in swamps near open water. Feeds in open lakes.
	Brown Pelican	*Pelecanus occidentalis*	Endangered	Nests in shrub thickets within dunes of barrier islands. Feeds in coastal waters.
	Piping Plover	*Charadrius melodus*	Endangered	Found on beaches and mudflats of barrier islands.
Reptile	Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	Warm bays and coastal waters, tidal rivers, estuaries, seagrass beds, sandy coastal beaches.

Reference 28

SECTION 7
SOIL EXPOSURE

Soil exposure is another potential route of exposure to hazardous substances attributable to the site. The discussion in this section focuses on the important soil exposure factors such as soil type, area of contamination, accessibility and the likelihood of exposure, and the potential targets.

7.1 SURFICIAL CONDITIONS

Information regarding the surficial conditions at the site is summarized in this section.

7.1.1 Soil Type

The predominant soil type found at the Delta Shipyard site is the Sharkey clay, which consists of poorly drained soils deposited in depressions along the borders of natural levee ridges. The surface layer is clay or silty clay in texture, dark gray, black, or dark brown and slightly acidic. The subsoils are mottled dark brown and gray plastic clay, neutral to mildly alkaline. Soils of the Sharkey series contain moderate amounts of organic matter from repeated deposits of clays and organic matter. As a result, these soils are quite fertile and support abundant growth of moisture-tolerant trees and an undergrowth of marsh plants (Reference 18).

The Swamp series is also found on-site and consists of clay and silty clay sediments deposited by the Mississippi River. They occur frequently in flooded forest areas and swamps, which border natural levee ridges. The surface layer is gray or black and medium acidic to neutral. The subsoils are gray and neutral to moderately alkaline. Swamp soils are poorly drained, frequently flooded by runoff, and typically support an undergrowth of marsh plants (Reference 18).

7.1.2 Areas of Contamination

All of the ESI source samples (Pits 1 through 3) were collected from a depth of 2 to 3 feet bgs. As such, these samples are not suitable for evaluation of the soil exposure pathway. However, the sample data from the 1994 SIP is sufficient because they were collected from the depth interval of 0 to 2 feet. The 1994 SIP results have been previously summarized in Subsection 3.2.1. Based on the results, four areas of surface contamination have been identified and are described as follows:

- Pit 1: 125 feet x 150 feet = 18,750 square feet
- Pit 2: 400 feet x 150 feet = 60,000 square feet
- Pit 3: 325 feet x 150 feet = 48,750 square feet
- Pit 4: 465 feet x 360 feet = 167,400 square feet

At each of the pits, hazardous substances were detected at concentrations exceeding three times background levels. The aggregate aerial extent of contaminated surface soil is approximately 295,000 square feet.

7.2 LIKELIHOOD OF EXPOSURE

Important factors related to the likelihood of exposure to an area of contaminated soil at the site are presented in the following subsections.

7.2.1 Attractiveness of the Site

The site is littered with heavy equipment and construction material and has no apparent recreational value. The parcels of land surrounding the site are occupied by industry.

7.2.2 Site Accessibility

A locked fence restricts public access to the active portion of EBI outside of regular business hours; however, the portion of the site containing the pits has no access restrictions. Empty beer cans were observed along the berm of Pit 3 during ESI field activities indicating casual trespassers or worker access to source areas.

7.2.3 Soil Analytical Results from Previous Investigations

WESTON collected surface soil and sludge samples during the 1994 SIP. The results have been previously summarized in Subsection 4.2.1

7.2.4 ESI Soil Sampling and Analytical Results

The only ESI surface soil sample was collected at station B01. The analytical results have been previously detailed in Subsection 5.2.7. Station B01 is located within a dense growth of vegetation, and was relatively inaccessible without the use of a bulldozer. As such, the results are better suited to evaluate the extent of groundwater contaminant migration than soil exposure risk.

7.3 SOIL EXPOSURE TARGETS

The resident population living or working in an area of soil contamination, the population living near areas of soil contamination, designated recreational areas and terrestrial resources such as agriculture are potential targets of soil exposure. The soil exposure targets identified are summarized in the following sections.

7.3.1 Resident Population

The resident population is defined as those persons living or attending school or day care on a property where soil contamination attributable to the site has been documented and whose residence, school, or day care center is within 200 feet of that contamination. There is an on-site trailer that is reportedly home to two friends of Mr. Dean (Reference 4). However, the trailer is not located within 200 feet of Pits 1 through 4.

7.3.2 Worker Population

The worker population is defined as those persons working on a property with an area of observed contamination and whose workplace area is on or within 200 feet of an area of observed contamination. According to Mr. Serigne, EBI employs approximately 30 workers (Reference 4).

7.3.3 Nearby Population

The nearby population includes those persons who live within 1 mile of areas of soil contamination attributable to the site. Those persons in houses, schools, or day care facilities within one mile of the site have been considered part of the nearby population.

WESTON reviewed 1990 Census information and used the EPA Graphical Exposure Modeling System (GEMS) database to estimate the nearby population living in specific distance intervals around the site (References 31 and 32). Based on available 1990 Census information, there are approximately 2.82 persons per household living in the vicinity of the site. The population distribution around the site is summarized in Table 7-1.

Based on observations during ESI field activities and a review of USGS maps of the area, there are very few population centers (schools, churches, and parks) located within 1 mile of the site. Much of the land within 1 mile of the site consists of swamps, streams, and undeveloped fields.

7.3.4 Sensitive Environments

Endangered species located in the region have been previously discussed in Subsection 6.3.2. The critical habitats of these species represent potential terrestrial sensitive environments; however, no critical habitats are known to be present at the site.

7.3.5 Resources

Resources associated with the soil exposure pathway may include commercial agriculture, commercial silviculture, and commercial livestock production or grazing. No resources are known to exist at or near the site.

7.4 SOIL EXPOSURE CONCLUSIONS

Based on the analytical results of the 1994 SIP and the ESI, approximately 295,000 square feet of surface soil contamination has been identified at the site. The contamination at station B01 and Pit 4 is beneath a healthy growth of vegetation and therefore does not appear to pose a significant soil exposure risk. However, the extremely elevated levels of surface BNA and metals contamination associated with Pits 1 through 3 are accessible to site workers and casual trespassers.

EXPANDED SITE INSPECTION REPORT

DELTA SHIPYARD
HOUMA, TERREBONNE PARISH, LA
EPA CERCLA ID NO. LAD058475419

TABLE 7-1
NEARBY POPULATION

DISTANCE INTERVAL (miles)	ESTIMATED POPULATION	REFERENCE
On-site	2	4
0 to ¼	0	32
¼ to ½	0	32
½ to 1	3,593	32

SECTION 8
AIR PATHWAY

The discussion in this section of the report focuses on the air pathway, another potential route of hazardous substance migration from the site. Atmospheric conditions, the likelihood of a release to air, and potential air pathway targets are identified below.

8.1 METEOROLOGICAL INFORMATION

The average annual temperature in Terrebonne Parish is approximately 69.2 degrees (Reference 18). The prevailing wind direction changes seasonally; wind roses are provided in Reference 33. Information concerning rainfall in the region was previously presented in Subsection 5.2.3 of this report.

8.2 LIKELIHOOD OF RELEASE

Information concerning a release to the air pathway is summarized in this subsection.

8.2.1 Air Sampling Results from Previous Investigations

No analytical data for the air pathway are known to exist.

8.2.2 ESI Air Quality Sampling and Analytical Results

Quantitative air sampling was not completed as part of the ESI. However, WESTON did perform continuous air monitoring of the breathing zone during the ESI site visits using an OVA. The OVA was used to qualitatively monitor organic vapor concentrations in the air. Conditions requiring upgrade in the level of personal protective equipment were encountered by the field sampling team based on OVA measurements in Pits 1 through 3 (Reference 4). As such, all pit sludge sampling was conducted in Level C personal protective equipment, consisting of full-face respirators, tyvek, steel-toed boots, and nitrile gloves.

However, the contaminants of concern at the site are relatively immobile in air since they have low vapor pressures and tend to adsorb to soil particles. OVA readings above background levels were not encountered outside of the pit berms.

8.3 AIR PATHWAY TARGETS

The population, resources, and sensitive environments within 4 miles of the site are potential targets of a release of hazardous constituents to the air pathway. The targets identified for the air pathway are discussed in the following subsections.

8.3.1 Population Within 4 Miles

Using GEMS and 1990 Census data, WESTON identified the approximate population residing in specific distance intervals within approximately 4 miles of the site. This population is summarized in Table 8-1.

8.3.2 Sensitive Environments

Sensitive environments have been identified previously in this report. Surface water related sensitive environments are described in Subsection 6.3, Surface Water Pathway Targets. Terrestrial sensitive environments are discussed in Subsection 7.3, Soil Exposure Targets.

8.3.3 Resources

Resources associated with air migration pathway may include commercial agriculture, commercial silviculture, and major designated recreational areas within 0.5 mile of a source at the site. No resources have been identified within 0.5 mile of the site.

8.4 AIR PATHWAY CONCLUSIONS

Site activities related to the pits have not occurred since at least 1985, and a release to air is not suspected. OVA measurements outside the pits did not exceed background levels. In addition, the primary contaminants of concern at the site have low vapor pressures, reducing the likelihood of a significant release to air. However, based on the following site conditions, a release of hazardous substances to the air pathway is of potential concern:

- OVA readings far exceeding WESTON site-specific health and safety plan action levels were recorded by the ESI field team.

- Pits 1 through 3 have minimal or no soil cover; hence, hazardous constituents in the pits are fully exposed to air.

EXPANDED SITE INSPECTION REPORT

DELTA SHIPYARD
HOUMA, TERREBONNE PARISH, LA
EPA CERCLA ID NO. LAD058475419

TABLE 8-1
POPULATION WITHIN 4 MILES

DISTANCE INTERVAL (miles)	REPORTED POPULATION	REFERENCE
On-site	2	4
0 to ¼	0	32
¼ to ½	0	32
½ to 1	3,593	32
1 to 2	13,252	32
2 to 3	17,001	32
3 to 4	6,642	32

SECTION 9
CONCLUSIONS

The Delta Shipyard site is located in southeastern Houma, Terrebonne Parish, Louisiana. The early details of site history are sketchy but indicate that the site was owned by Delta Ironworks and was part of a large industrial park covering 165 acres and home to seven divisions of Delta Ironworks, including Delta Shipyard. Available information indicates that Delta Shipyard was the only division that handled hazardous wastes. The site was sold to Lynn Dean in 1986. Current site operations consist of the fabrication and operation of offshore lift boats and the manufacture of cranes for offshore platforms.

While in operation, Delta Shipyard was a cleaning and repair facility for small cargo boats, fishing boats, and oil barges. Before repair work could begin, the boats had to be certified vapor free by the U.S. Coast Guard. To accomplish this, the boats were steam cleaned to remove oily wastes. Wastes were stored in two unlined pits used as evaporation ponds. The pits were later closed and backfilled in 1984 under the supervision of LDEQ. Four additional unlined pits are located at the site and were reportedly used to dispose of waste oil and oil field drilling material. A drainage ditch adjacent to the pits discharges to a perennial-flowing canal located immediately east of the site.

Over 60 samples were collected during the ESI to document the presence and evaluate the extent of migration of hazardous substances associated with the Delta Shipyard site. The analytical results for samples collected during this investigation show extremely elevated levels of VOCs, PAHs, and metals in the on-site pits, and a moderate degree of off-site migration. The estimated volume of sludge in Pits 1 through 3 is approximately 31,000 cubic yards. Concerns associated with the migration and exposure pathways are summarized as follows:

- As discussed in Section 5, although subsurface soils at the site have been shown to have low permeabilities, shallow groundwater contamination has been documented between the pits and the Company Canal. There are no groundwater drinking water wells within 4 miles of the site and groundwater is not used as a resource in the Houma area. However, based on the proximity of the contaminated groundwater to the Company Canal, a strong potential exists for the continuing release of site-attributable contaminated groundwater to surface water.

- As discussed in Section 6, the sampling strategy implemented in this investigation focused on documenting the extent of surface water contaminant migration. The results suggest the migration of hazardous substances from the pits to the drainage ditch, into the Company Canal, and at least 1,000 feet downstream of the PPE. A

City of Houma stream drinking water intake located over 2 stream miles from the site appears to be unaffected by site contamination, but fisheries and wetlands have been identified within the surface water flow path for the site and crab fishermen were observed 3,000 feet from the farthest documented downstream point of site-related sediment contamination.

- As discussed in Section 7, soil exposure is of moderate concern based on presence of high levels of surface contamination documented in Pits 1 through 4 during the 1994 SIP. The aggregate aerial extent of contaminated surface soil is approximately 295,000 square feet. There are no residents, school, or workers within 200 feet of the pits, but they are accessible to workers and casual trespassers.

- As discussed in Section 8, a significant release of hazardous substances to the air pathway is not suspected based on the low volatility of the contaminants of concern at the site. However, Pits 1 through 3 have sparse vegetative cover. In addition, organic vapor concentrations within the pit berms were encountered by the ESI field team and required the use of full-face respirators to complete the pit sludge sampling.

Based on the results of the ESI, WESTON has identified the following data gaps:

Groundwater Quality Near Pit 4

The high degree of groundwater contamination discovered near Pits 1 through 3 during the ESI raises questions about the groundwater quality near Pit 4. Pit 4 is overgrown with grass, but soil samples collected in the upper two feet during the 1994 WESTON SIP indicated elevated concentrations of barium (18,900 mg/kg) and zinc (666 mg/kg). There is currently no available chemical data to evaluate the degree of Pit 4 subsurface contamination and the extent of groundwater to surface water hazardous constituent migration between Pit 4 and Bayou La Carpe.

Elevation of On-Site Groundwater vs. Off-Site Surface Water

Comparison data of groundwater levels beneath the site versus surface water levels in the Company Canal is not available. In addition, further evaluation of the groundwater and surface water elevations in the site vicinity could help determine if effluent conditions exist for a long enough period of time for contaminants to flow from the pits to the Company Canal.

Attribution of Surface Water Contamination

Shipyard facilities and drilling mud supply companies have operated in the Houma, Louisiana area for over 20 years. These facilities likely used similar processes to clean and repair boats resulting in the potential release of constituents such as those identified at the Delta Shipyard site. Attribution of barium within the 15-mile TDL needs to be evaluated before additional sampling

takes place in the surface water pathway. The ESI results generally indicate migration of site-related contaminants from the pits to at least 1,000 feet downstream of the PPE. Crab fishermen were observed during the ESI approximately 3,000 feet south of the farthest documented downstream point of site-related stream sediment contamination. Based on the occurrence of elevated levels of PAHs and barium in the groundwater and drainage ditch sediment samples collected on-site, releases to surface water are probably continuing. If barium contamination in the surface water pathway is determined to be solely attributable to the Delta Shipyard site, then further investigation of stream sediment and surface water quality within 1 mile of the site may be warranted.

ESI Conch
for Delta
barium & zinc

SECTION 10
REFERENCES

1. WESTON (Roy F. Weston, Inc.). 1996. Standard Operating Procedure to Determine Site Latitude and Longitude. Calculation Worksheet for the Delta Shipyard Site. 12 February 1996.

2. USGS (U.S. Geological Society). 1963. Photorevised 1980. Houma, Louisiana (7.5-minute series topographic map).

3. EPA (U.S. Environmental Protection Agency, Region 6). 1996. Site Access Letter and Access Agreement between EPA and Mr. Lynn Dean.

4. Tate, E. 1996. WESTON. Field Logbook Notes for the Delta Shipyard Site. WESTON Document Control Number 4603-026-059.

5. TETC (The Earth Technology Corporation). 1984. *EPA Potential Hazardous Waste Site, Site Inspection Report: Delta Shipyard.* 12 September 1984.

6. Dussel, C. 1985. Wink Engineering. Personal Communication with Glenn Miller, Louisiana Department of Environmental Quality (LDEQ). 5 July 1985.

7. E&E (Ecology and Environment, Inc.). 1981. *EPA Potential Hazardous Waste Site Identification and Preliminary Assessment.* 11 March 1981.

8. STS (Soil Testing Engineers, Inc.). 1980. *Preliminary Report of Soil Borings and Laboratory Testing: Delta Shipyard Disposal Pit, Houma Louisiana.* November 1980.

9. E&E. 1981. *EPA Potential Hazardous Waste Site: Site Inspection Report.* 11 March 1981.

10. Healy, G. Louisiana Department of Natural Resources. 1983. Personal Communication with Christian Olivier, Delta Shipyard. 20 May 1983.

11. LDEQ. 1986. *General Inspection Report: Delta Shipyard Site.* 7 May 1986.

12. WESTON. 1994. *Site Inspection Prioritization Report: Delta Shipyard.* December 1994.

13. Rollo, J.R. USGS. 1960. *Water Resources Bulletin No. 1: Ground Water in Louisiana.* Baton Rouge: pp. 41-45.

14. LGS (Louisiana Geological Survey). 1984. Geologic Map of Louisiana.

15. Hayes, D. 1996. WESTON. Geologic Drill Logs for the Delta Shipyard Site.

16. LDPW (Louisiana Department of Public Works). 1971. "Ground Water Resources and Requirements for Louisiana, 1970-2020." *Comprehensive Water and Related Land Resources Study*. Series 2, Vol. 2. pp. 129, 163-166.

17. LDTD (Louisiana Department of Transportation and Development). 1996. Water Well Information.

18. SCS (Soil Conservation Service). 1960. *Soil Survey of Terrebonne Parish, Louisiana.*

19. Dunne, T. and L. Leopold. 1978. *Water in Environmental Planning*. W.H. Freeman and Company, New York. pp. 136-138.

20. WESTON. 1996. Net Annual Precipitation Calculation. Calculation Worksheet for Delta Shipyard.

21. Sampey, B. 1996. City of Houma Water Plant. Personal Communication with Joy Ishigo, WESTON. 12 March 1996.

22. FEMA (Federal Emergency Management Agency). 1985. Terrebonne Parish, Louisiana (Flood Insurance Rate Map, Community Panel No. 225206 0265 C). 1 May 1985.

23. Department of Commerce. 1961. *2-Year 24-Hour Precipitation Map of the United States.* Technical Paper No. 40.

24. EPA. 1996. *Drinking Water Regulations and Health Advisories.*

25. Ishigo, J. 1996. WESTON. Personal Communication with Bryan Sampey, Plant Manager, Houma Public Water Plant. 5 March 1996.

26. Ishigo, J. 1996. WESTON. Personal Communication with Prosper Toups, Louisiana Public Water Supply. 14 March 1996.

27. U.S. Fish and Wildlife Service. 1991 and 1992. Dulac, Houma, and Lake Quitman, Louisiana (7.5-minute National Wetlands Inventory maps).

28. Rettig, V. 1996. U.S. Fish and Wildlife Service. Personal Communication with Joy Ishigo, WESTON. 5 March 1996.

29. Ishigo, J. 1996. WESTON. Personal Communication with Gerald Adkins, Fishery Biologist, Louisiana Department of Wildlife and Fisheries. 14 March 1996.
30. Tate, E. 1996. WESTON. Personal Communication with Dugan Sabinas, LDEQ. 12 August 1996.

31. Bureau of the Census. 1991. *1990 Census of Population and Housing: Summary Population and Housing Characteristics, New Mexico.*

32. EPA. 1996. Graphical Exposure Modeling System (GEMS). 1990 Census Data.

33. Environmental Science Services Administration. 1968. *Climatic Atlas of the United States.*

APPENDIX A

PHOTOGRAPHS AND STREAM SEDIMENT SAMPLE STATION GPS COORDINATES

This Document Contained Material Which Was Not Filmed/Scanned

Title _____

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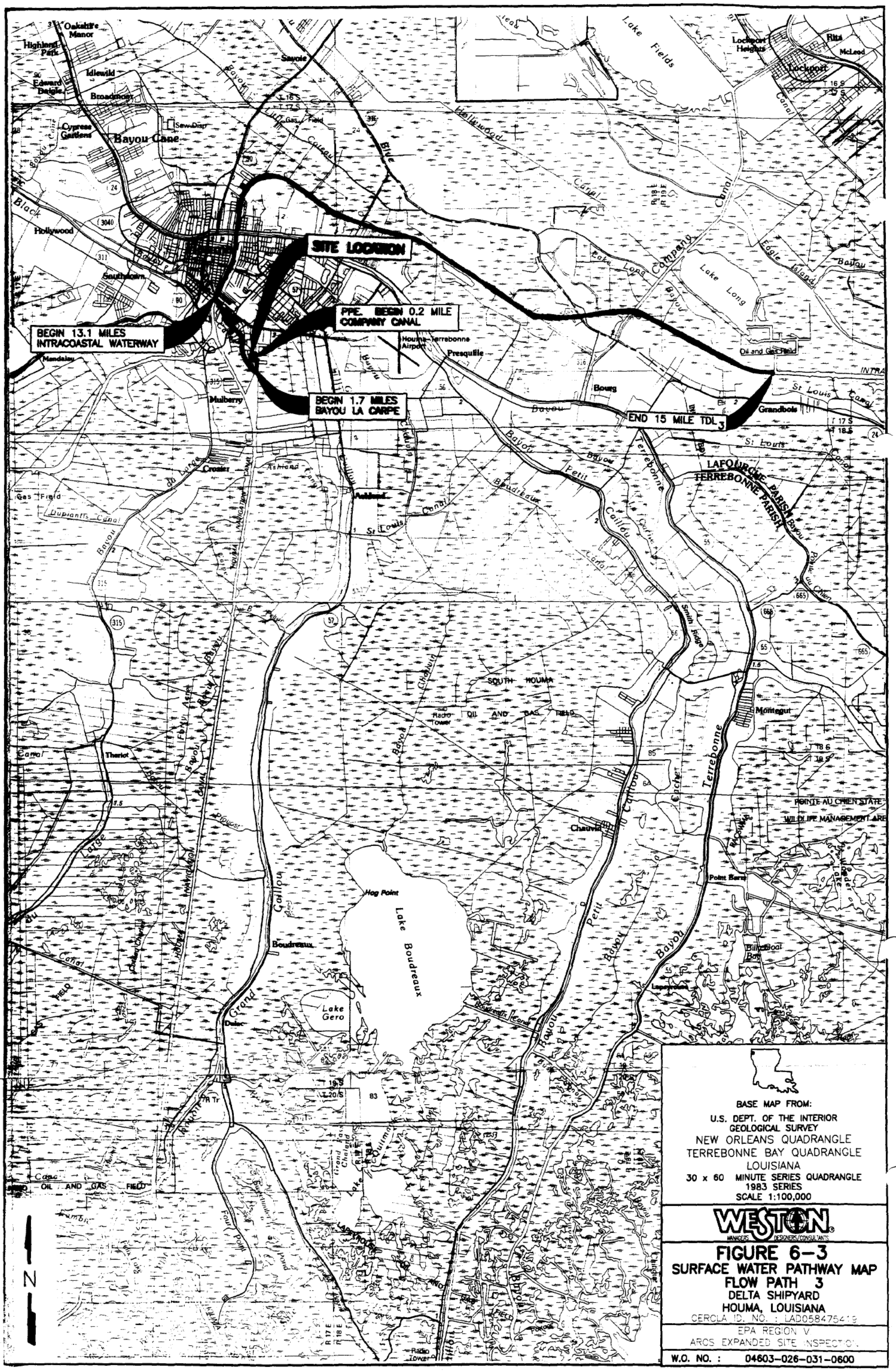
Please Refer to the File in Superfund Records Center

STREAM SEDIMENT SAMPLE STATION GPS COORDINATES

Sample Station	Latitude	Longitude
D05	29°33'53.178"N	90°42'17.268"W
D06	29°33'53.072"N	90°42'15.352"W
D07	29°33'53.177"N	90°42'13.718"W
D08	29°33'41.511"N	90°42'18.077"W
D09	29°33'41.03"N	90°42'15.537"W
D10	29°33'42.983"N	90°42'13.836"W
D11	29°34'21.683"N	90°42'38.813"W
D12	29°34'21.419"N	90°42'38.959"W
D13	29°34'20.592"N	90°42'39.62"W
D14	29°34'35.708"N	90°43'25.465"W
D15	29°34'36.854"N	90°43'26.289"W
D16	29°34'37.953"N	90°43'28.769"W
D17	29°34'30.577"N	90°43'2.078"W
D18	29°34'30.548"N	90°43'3.412"W
D19	29°34'30.786"N	90°43'4.695"W
D20	29°33'42.279"N	90°42'40.110"W
D21	29°33'42.050"N	90°42'40.688"W
D22	29°33'40.529"N	90°42'42.982"W
D23	29°33'02.917"N	90°42'15.308"W
D24	29°33'01.778"N	90°42'17.127"W
D25	29°33'01.492"N	90°42'20.462"W
D26	29°33'14.273"N	90°42'14.680"W
D27	29°33'12.439"N	90°42'18.911"W
D28	29°33'10.056"N	90°42'24.754"W
D29	29°32'52.829"N	90°42'15.717"W
D30	29°32'52.547"N	90°42'16.953"W
D31	No Data	No Data
D32	29°35'46.888"N	90°42'38.986"W
D33	29°34'57.209"N	90°42'59.329"W
D34	No Data	No Data



BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
NEW ORLEANS QUADRANGLE
TERREBONNE BAY QUADRANGLE
LOUISIANA
30 x 60 MINUTE SERIES QUADRANGLE
1983 SERIES
SCALE 1:100,000

WESTON
MANAGERS DESIGNERS/CONSULTANTS

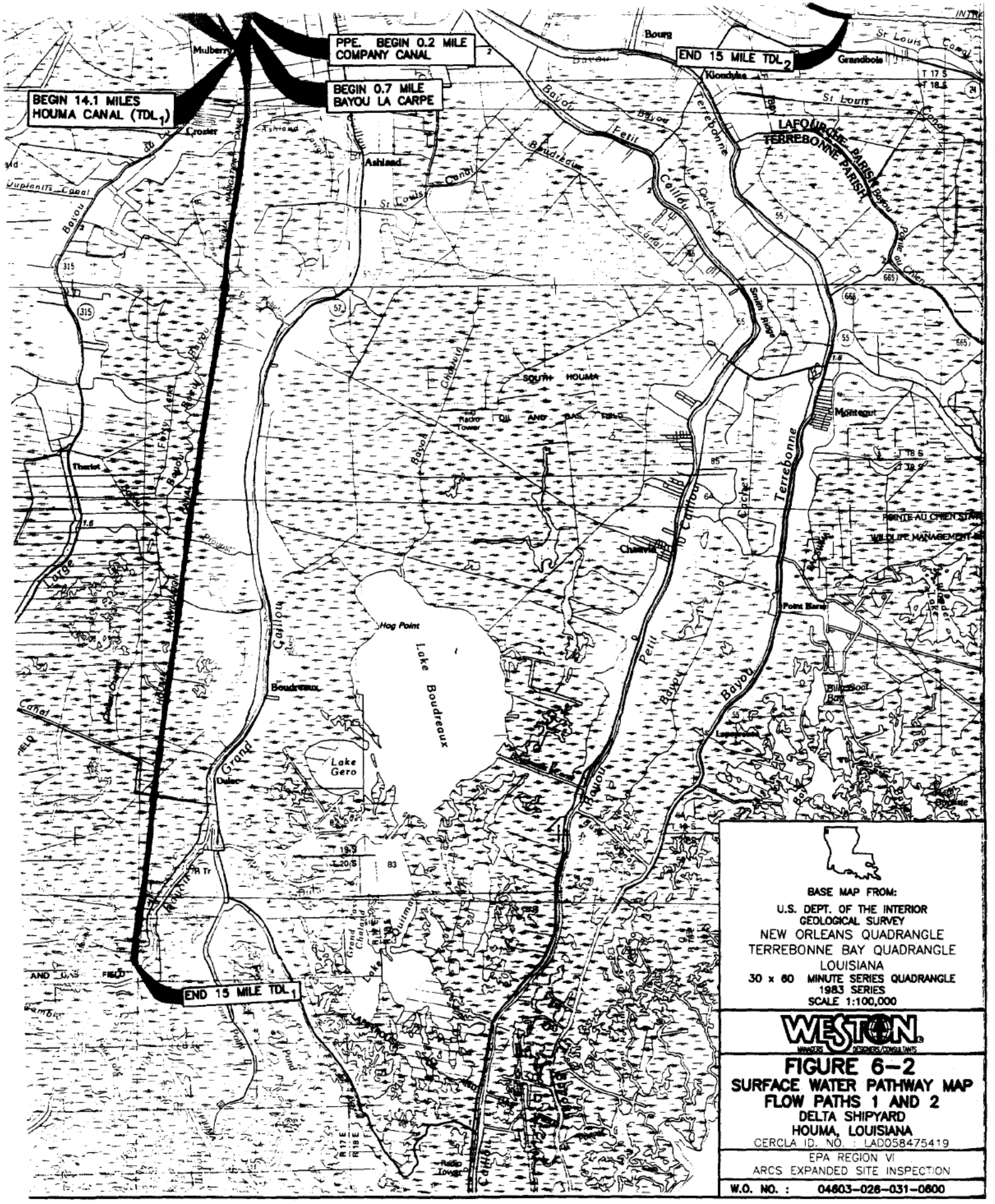
FIGURE 6-3
SURFACE WATER PATHWAY MAP
FLOW PATH 3
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419
EPA REGION V
ARCS EXPANDED SITE INSPECTION
W.O. NO. : 04603-026-031-0600

APPENDIX B

DATA PACKAGE EXCERPTS

APPENDIX C

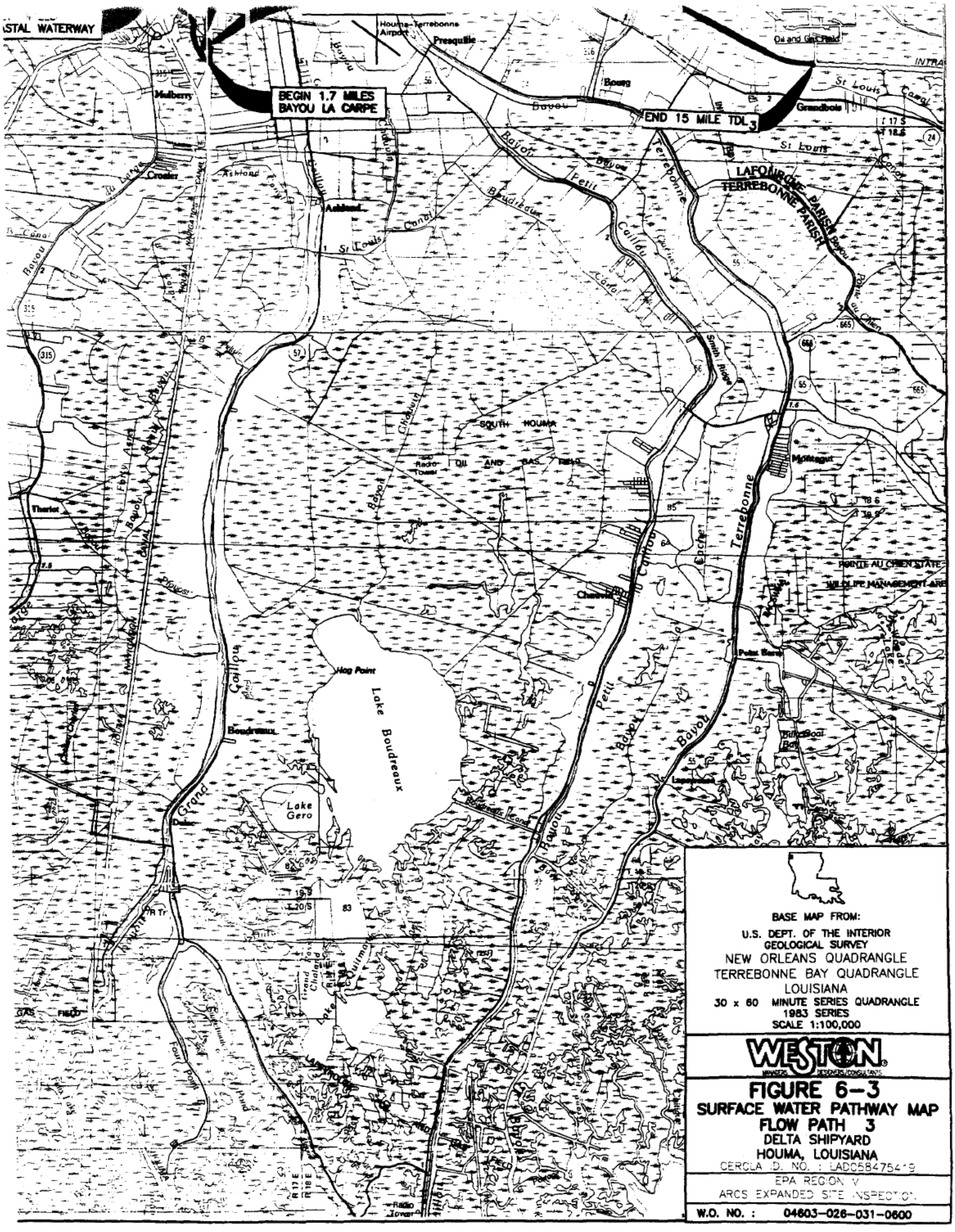
CRQLs/CRDLs AND ANALYTICAL RESULTS SUMMARY



BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
NEW ORLEANS QUADRANGLE
TERREBONNE BAY QUADRANGLE
LOUISIANA
30 x 60 MINUTE SERIES QUADRANGLE
1983 SERIES
SCALE 1:100,000

WESTON
MANAGERS DESIGNERS/CONSULTANTS

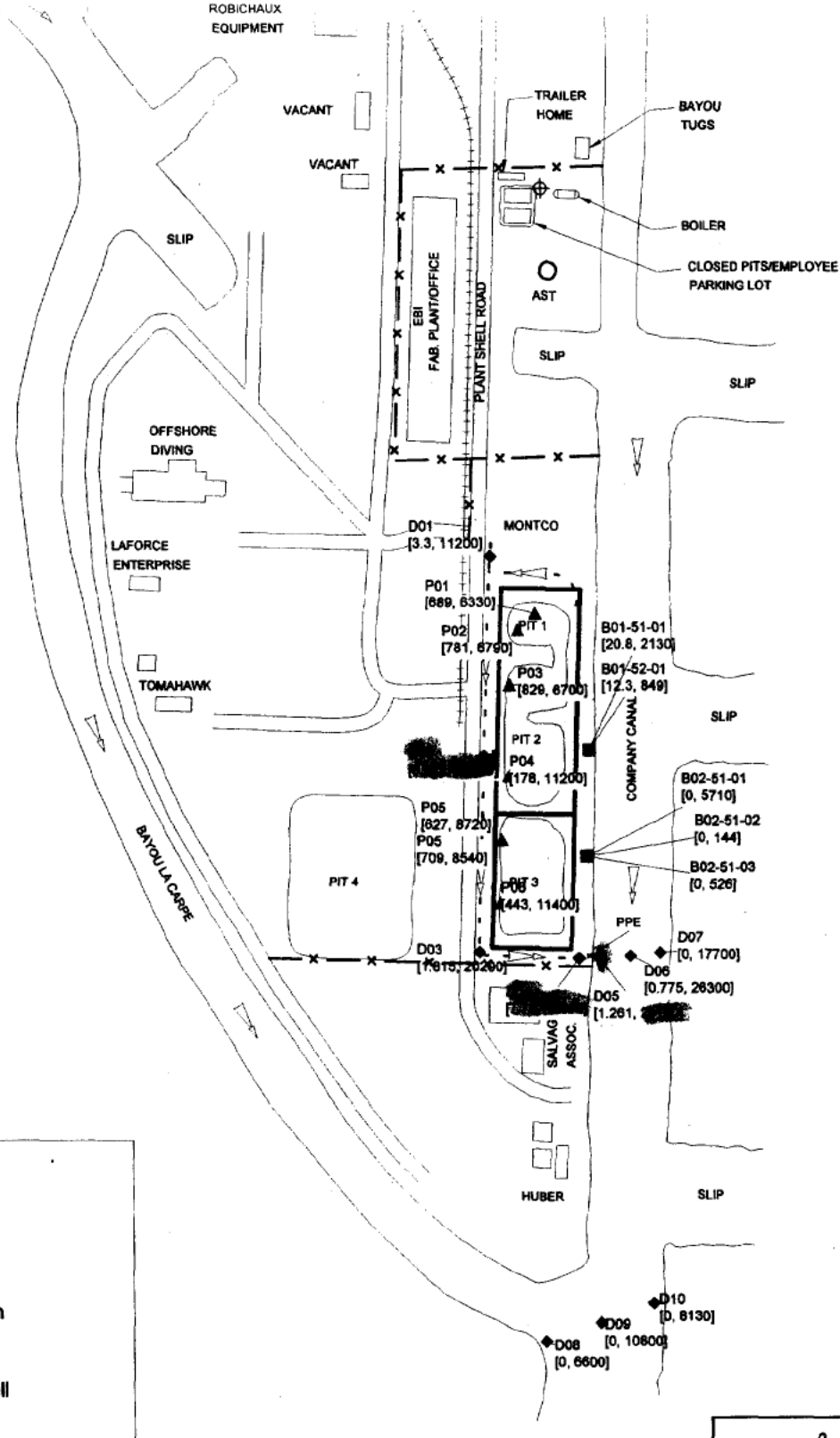
FIGURE 6-2
SURFACE WATER PATHWAY MAP
FLOW PATHS 1 AND 2
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419
EPA REGION VI
ARCS EXPANDED SITE INSPECTION
W.O. NO. : 04803-026-031-0600



BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
NEW ORLEANS QUADRANGLE
TERREBONNE BAY QUADRANGLE
LOUISIANA
30 x 60 MINUTE SERIES QUADRANGLE
1983 SERIES
SCALE 1:100,000

WESTON
MANAGERS / ENGINEERS / CONSULTANTS

FIGURE 6-3
SURFACE WATER PATHWAY MAP
FLOW PATH 3
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA I.D. NO. : LAD058475419
EPA REGION V
ARCS EXPANDED SITE INSPECTION
W.O. NO. : 04603-026-031-0600



LEGEND

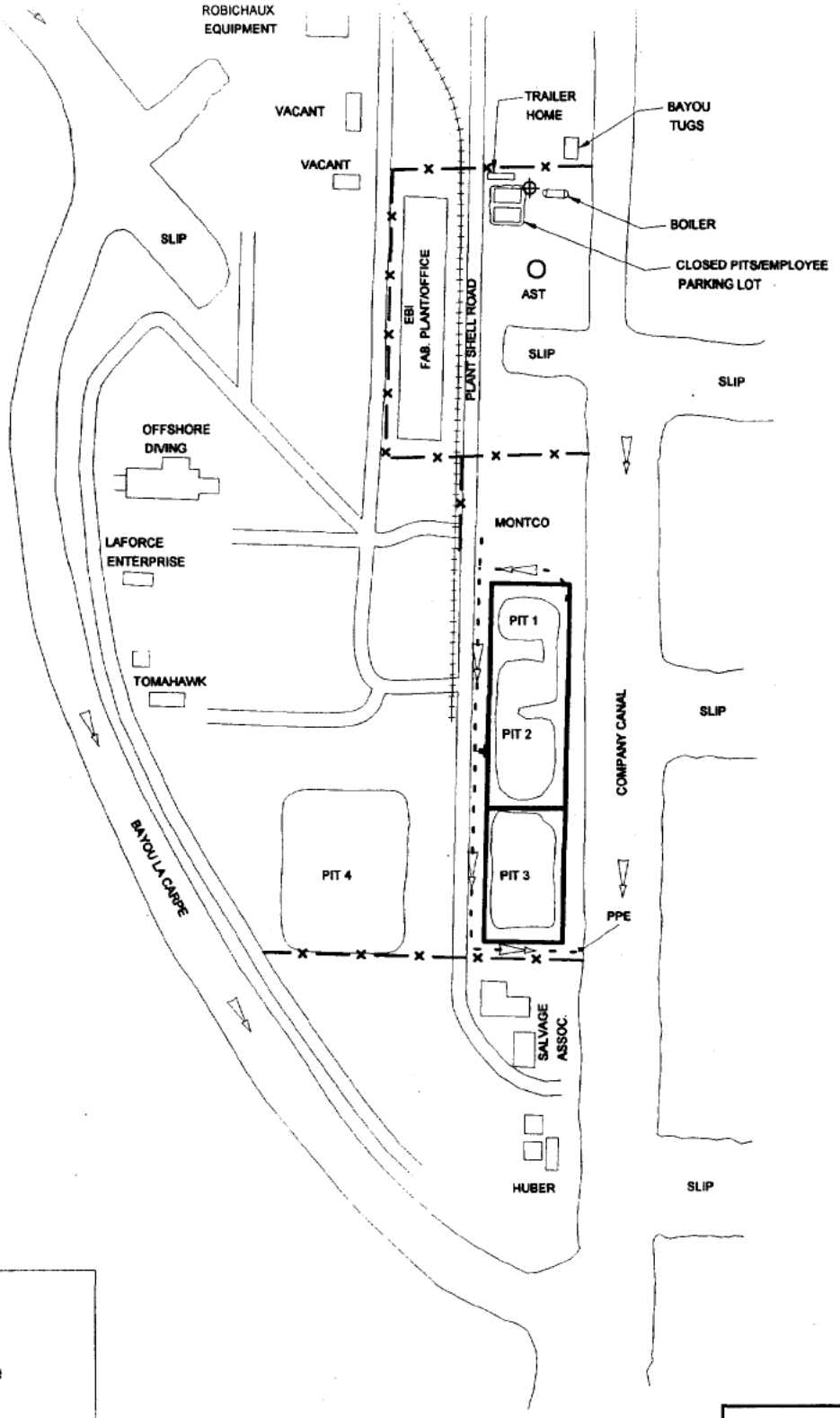
- Overflow Pipe
- Fence
- Drainage Ditch
- Flow Direction
- Monitoring Well
- Berm
- Sediment Sample
- Pit Sample
- Soil/Geoprobe Boring Sample
- [709, 8540] [Total PAH Conc. (mg/kg), Barium Conc. (mg/kg)]

0 200 400
Feet

WESTON

FIGURE 3-1

SAMPLE LOCATION MAP
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO.: LAD058475419
EPA REGION VI
ARCS EXPANDED SITE INSPECTION
W.O. NO.: 04603-026-031-0600



LEGEND

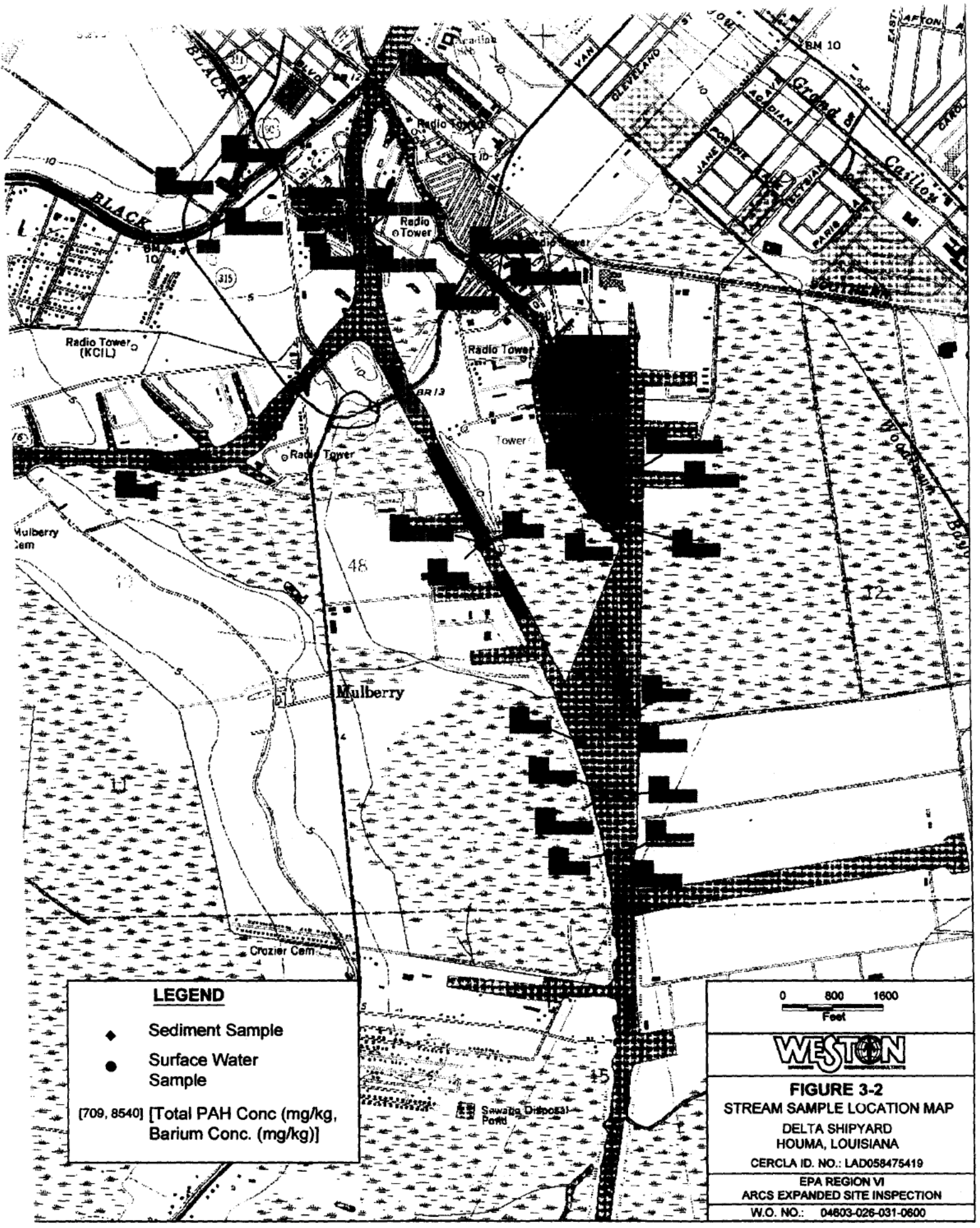
- Overflow Pipe
- Fence
- Drainage Ditch
- Flow Direction
- Monitoring Well
- Berm

0 200 400
Feet

WESTON

FIGURE 2-2
SITE PLAN
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO.: LAD058475419
EPA REGION VI
ARCS EXPANDED SITE INSPECTION
W.O. NO.: 04803-026-031-0600

96868


BM 10
Radio Tower
Radio Tower (KCIL)
Mulberry
Crozier Cem
Sewage Disposal Pond
48
45
LEGEND
Sediment Sample
Surface Water Sample
[709, 8540] [Total PAH Conc (mg/kg, Barium Conc. (mg/kg)]
0 800 1600
Feet
WESTON
FIGURE 3-2
STREAM SAMPLE LOCATION MAP
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO.: LAD058475419
EPA REGION VI
ARCS EXPANDED SITE INSPECTION
W.O. NO.: 04603-026-031-0600

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Title _____

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ATTACHMENT 1

SITE INSPECTION PRIORITIZATION REPORT
AND PRESCORE PACKAGE
DELTA SHIPYARD
PHASE III
HOUMA, LOUISIANA
EPA ID NO.: LAD058475419

Prepared for:

U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Contract No.: 68-W9-0015
Work Assignment: 27-6JZZ
Document Control No.: 4603-27-0229

Submitted by:

Roy F. Weston, Inc.
5599 San Felipe, Suite 700
Houston, Texas 77056
(713) 621-1620

Peter M. Rung/Robert B. Beck, P.E.

December 1994

microfiche

INTRODUCTION

Roy F. Weston, Inc. (WESTON®) is pleased to present this report, which summarizes the results of the file review and PREscore package completed for the Delta Shipyard (DS) site (LAD058475419) in Houma, Terrebonne Parish, Louisiana. WESTON was tasked by the U.S. Environmental Protection Agency Region VI (EPA VI) to review existing file information and gather additional information (Phase III activities) that would more accurately determine a site score for the DS site. This effort is part of the Site Inspection Prioritization (SIP) Work Assignment for various sites in EPA VI. The PREscore package for the site is attached as part of the report.

EPA established the SIP process to help assess known or potential hazardous waste sites, address first those sites that pose the greatest threat to human health and the environment, and standardize the criteria by which sites are evaluated within the Superfund program. Through the SIP, EPA reviews sites that generally have had a complete Site Inspection (SI) performed on them but that have not received a final decision regarding the need for further investigation or remediation. The outcome of the SIP indicates whether the available information for the site meets a minimum standard of evaluation reflecting the requirements of the revised Hazard Ranking System (HRS). The SIP process better enables EPA to determine if a site is likely to receive a score of 28.5 or above under the HRS, potentially making it a candidate for placement on the National Priorities List (NPL). If it is determined that the site will not score above the NPL threshold of 28.5, EPA is in a position to declare that the site evaluation, under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), has been accomplished.

SITE BACKGROUND INFORMATION

The DS site is located in Houma, Terrebonne Parish, Louisiana. The geographic coordinates of the site are approximately latitude 29°34'2" north and longitude 90°42'18" west. A Site Location Map is provided in Attachment 1 as Figure 1, and a Site Area Map is provided in Attachment 1 as Figure 2. The site can be reached by traveling south on Highway 90 into Houma until reaching East Main Street. Travel east on Main Street for approximately 1.8 miles and turn south on Howard Avenue. From Howard Avenue, travel south for approximately 2.2 miles until reaching Industrial Boulevard. Turn east and travel 0.5 mile. The site is on the south side of Industrial Boulevard.

WESTON contacted Lynn Dean of Elevated Boats Incorporated (EBI) (8404 Colonel Drive, Shelmett, Louisiana 70043), the present owner of the site, in May 1994. Kenneth Serigne, Department Manager for the EBI property, signed an EPA Access Agreement on 15 June 1994, allowing WESTON access to the DS site. Mr. Dean was reached at (504) 278-4200. Mr. Serigne was reached at (504) 868-9655. WESTON met with Mr. Serigne during the site reconnaissance and site sampling mission.

WESTON completed the SIP site reconnaissance on 12 July 1994. The 40-acre site is part of a large industrial park covering approximately 165 acres in southeastern Houma, Louisiana. The industrial park occupies land between a boat slip and Bayou La Carpe. Bayou La Carpe provides access to the Gulf of Mexico through the Houma Intercoastal Waterway. EBI purchased 110 acres of the park in 1985 and currently leases part of it to other industries. The site is surrounded by Gemoco to the north, Christie Industries to the southeast, and Offshore Diving, Salvaging, and Blasting Company to the west. EBI maintains an active fabrication plant/office building on-site.

DS owned the site prior to EBI; the year operations began at the site is unknown. DS consisted of a barge gas-freeing operation and a cleaning and repairing facility for small cargo vessels, fishing vessels, and oil barges. The gas-freeing operation was required because the vessels had to be certified vapor free by the U.S. Coast Guard before repair work could commence. As part of the gas-freeing process, the vessels were steam-cleaned and the oily wastes were removed. The generated oils and wastewater were sent through a separation process after which the waste oil was recovered and sold. Wastes were stored in surface impoundments on-site. Two small waste pits, located approximately 100 feet east of the fabrication building, were sampled and closed in 1984 under the supervision of the Louisiana Department of Environment Quality (LDEQ) Hazardous Waste Division. Two monitoring wells are reportedly located around the closed pits; however, during the site reconnaissance, only one could be located. The pits were reportedly used to dispose of waste oil and oil field drilling material. A Site Plan Map is provided in Attachment 1 as Figure 3.

The DS site contains old gas-stripping equipment (i.e., storage tanks, separator, boiler) left behind from the former operation. The two closed waste oil surface impoundments are now a parking lot used by EBI employees. Four larger pits are located approximately 800 feet south of the fabrication building and are surrounded by dense vegetation. One pit is located west and the other three are located east of Plant Shell Road. According to a Wink Engineering sampling report in 1985, the pit west of the road is actually three pits in series that have been covered over with fill material. For the purposes of this Phase III report, these pits are considered one single pit. The three pits east of the road are exposed and covered with a crusty black substance. At the time of the site reconnaissance, rainwater containing an oily sheen was pooled on the surface of the pits.

The groundwater, soil, and surface water migration pathways are of concern at the site because of possible hazardous constituents being released to these pathways.

Previous investigations at the DS site include the following:

- A Site Inspection (SI) by Ecology & Environment, Inc. on 11 March 1981.
- A SI by The Earth Technology Corporation on 12 September 1984.
- A sampling report by Wink Engineering in July 1985.

Phase III DATA

Additional site information resulting from Phase III SIP efforts (information/data gathering/site reconnaissance/sampling mission) is described below.

Identification and Location of Groundwater Wells

WESTON used file information from EPA VI and contacted the Louisiana Department of Transportation (LDOT) for information on water wells within a 1-mile radius of the site. LDOT files indicate several monitoring wells and 1 rig supply well are located within a 1-mile radius of the site. The rig supply well is plugged and abandoned. The closest wells are three monitoring wells located 2,000 feet to the northeast of the site. They are owned by Torch Energy and are completed in the Mississippi River Alluvial Aquifer Confining Unit. They were drilled in 1990 and range from 7 to 10 feet deep. A Water Well Location Map is provided in Attachment 1 as Figure 4.

Determination of Surface Water Intakes Within the Target Distance Limit

WESTON contacted Bryan Sampey, Plant Manager at the Houma District 3 Water Plant, to determine surface water intakes within the 15-mile stream-flow Target Distance Limit (TDL). The plant is located near the confluence of the Houma Navigational Canal and Bayou Black. Mr. Sampey stated that the Houma plant takes its water from the Houma Navigational Canal. The canal is tidally influenced and saltwater intrusion is a problem. The plant uses Bayou Black as a secondary source of water when saltwater intrusion occurs in the canal. According to Mr. Sampey, the plant serves an estimated 30,000 people. The plant lies 2.55 stream miles upstream of the PPE; however, the canal is tidally influenced and therefore contaminants from the DS site could possibly migrate towards the water plant.

Identification and Location of Wetlands and Sensitive Environments

Surface water runoff draining from the site flows into Bayou La Carpe. Bayou La Carpe enters the Houma Navigational Canal just south of the site. According to the Houma, Louisiana, 7.5-minute wetlands map, the Houma Navigational Canal is bordered by extensive wetland areas. A Surface Water Pathway Map is provided in Attachment 1 as Figure 5.

Site Accessibility

Based on the WESTON Phase III site reconnaissance and sampling mission, the site is fairly accessible to the general public by both vehicle and foot. However, the site is located in an industrial park and the land has little or no recreational value.

Determination of Population by Distance Rings

During the Phase III effort, WESTON determined the population within target distances using the Geographical Exposure Modeling System (GEMS) Database. According to GEMS, 15

people live within the 0.25- to 0.5-mile radius, 3,578 people live within the 0.5- to 1-mile radius, and 36,895 live within the 1- to 4-mile radius of the site.

Identification of Fisheries

WESTON contacted Gerald Adkins of the Louisiana Department of Wildlife and Fisheries (LDWF) to determine if fisheries existed within the 15-mile TDL. Bayou La Carpe and the Houma Navigational Canal are considered limited fisheries because of problems with saltwater intrusion and marine traffic. Adkins stated that at certain times of the year, some freshwater catfish and crab fishing takes place.

Sampling Information

In general accordance with the objectives of the SIP, WESTON implemented a sampling strategy primarily aimed at documenting the presence of hazardous substances at the DS site. WESTON collected soil and sediment samples at the site on 22 August 1994. WESTON completed the sampling activities in general accordance with the site-specific Task Work Plan and Health and Safety Plan. All samples collected during the SIP were shipped to EPA-designated laboratories by Federal Express Priority Overnight Service. Samples requiring organic analyses were sent to Keystone Lab, Houston, Texas, and samples requiring inorganic analyses were sent to Silver Valley Labs, Inc., Kellog, Indiana. CLP data package excerpts are provided in Attachment 4. The sampling activities and analytical results associated with the waste source characterization are summarized in this section of the report.

WESTON collected seven sediment samples (SED-1 through SED-7) and three soil samples (SS-1 through SS-3) in an effort to document the presence and migration of hazardous substances associated with the potential hazardous waste source areas (HWSAs) at the site. Sample locations are shown in Attachment 1 as Figure 6. SIP soil/sediment sample locations, descriptions, and rationales are summarized in Attachment 3 as Table 1.

The soil and sediment samples were analyzed for the following parameters:

- Volatile organic compounds (VOCs),
- Base, neutral, and acid extractable compounds (BNAs),
- Pesticide and polychlorinated biphenyls (PCBs), and
- Inorganic constituents and cyanide.

HRS SCORING

Preliminary PAscore

Using the data provided by EPA VI from Resource Conservation and Recovery Act (RCRA) and CERCLA files, WESTON developed a preliminary HRS score for the site using PAscore

(Version 2.0). The site received a PAscore of significant value to warrant evaluation of the site using PREscore. PREscore was used to develop and document the HRS score for the site in more detail.

PREscore

Factors that had the greatest influence on the Phase III PREscore evaluation are identified in the following sections. Conclusions concerning the site HRS score are presented following the discussion of factors affecting the PREscore. The Phase III PREscore package for the site is provided as Attachment 2.

WASTE SOURCE CHARACTERISTICS

The laboratory analytical results for soil samples SS-2 and SS-3 and sediment samples SED-1, SED-2, and SED-3 were collected from the pits during the SIP and can be used to characterize the potential HWSAs.

Four waste source areas were identified in the file review and site reconnaissance. They consist of four pits used to store waste oils from the DS ship cleaning and repair operation. Pit 4 is actually three pits according to a Wink Engineering report; however, the pits are aligned in series, covered over, and vegetated. For purposes of the Phase III report, they are designated together as Pit 4. The other three pits (1, 2, and 3) are exposed and covered by a black crusty substance. Pits 1, 2, and 3 are elevated and surrounded by a 3- to 6-foot berm. The four pits together have an approximated surface area of 294,000 square feet. The waste characteristics of the site were assessed for the groundwater, soil, and surface water exposure pathways.

Samples collected from the pits indicate the presence of volatiles, semivolatile organics, pesticides, and metals. Sediment analytical results reported at concentrations exceeding three times background concentrations are summarized in Attachment 3, Tables 2 and 3. Soil analytical results reported at concentrations three times background concentrations are summarized in Attachment 3, Table 4. The CLP data summary package is provided as Attachment 4 and photodocumentation is provided as Attachment 5.

Groundwater Pathway

WESTON did not collect any groundwater samples as part of this effort. As part of the monitoring well installation in 1984, soil borings were drilled at the site. The borings indicated low permeability silty clays to 50 feet below grade. No groundwater uses, domestic or industrial, were documented within a 1-mile radius of the site. The factors that most influenced the groundwater pathway Phase III score are as follows:

- LDOT information stating that there is no groundwater use within 1 mile of the site.

- The lack of analytical data to determine a release of hazardous wastes to groundwater in the vicinity of the site.

- The low permeability of the clay soils at the site.

Surface Water Pathway

The laboratory analytical results for sediment samples SED-4 through SED-7 collected during the SIP can be used to characterize the potential for contaminant migration in the surface water pathway. A drainage ditch runs along the west and south ends of Pits 1 through 3. An overflow pipe on Pit 2 drains rainwater from the pit into the ditch. Surface water draining from the pits follows the ditch approximately 0.3 mile until reaching the probable point of entry (PPE) at Bayou La Carpe. Bayou La Carpe flows approximately 4,000 feet south until reaching the Houma Navigational Canal. The Houma Navigational Canal is tidally influenced. Due to the tidal influence, two TDLs are assigned to the site, TDL-1 and TDL-2. TDL-1 is located approximately 2.55 miles upstream of the PPE at the water plant, the farthest point where saltwater intrusion has been documented. TDL-2 is located 15 miles downstream in the Houma Navigational Canal.

The Houma Water Plant is located at the confluence of Bayou Black and the Houma Navigational Canal, approximately 2.55 miles upstream of the site. Bryan Sampey, plant manager of the Houma Water Plant, stated that when saltwater intrusion becomes a problem at the surface water intake, the plant switches to Bayou Black for a water supply. The saltwater encroachment is typically seasonal. The plant reportedly serves 30,000 residents in the surrounding area. According to Gerald Adkins of LDWF, Bayou La Carpe and the Houma Navigational Canal are considered limited fisheries because of saltwater intrusion and marine traffic.

Sediment samples collected from the drainage ditch surrounding Pits 1 through 3 indicate the presence of several semivolatile organics and metals. Sediment analytical results reported at concentrations exceeding three times background concentrations are summarized in Attachment 3, Tables 2 and 3. A Surface Water Pathway Map is provided in Attachment 1 as Figure 5.

Soil Exposure Pathway

The site is situated near a residential area and is accessible to the public; however, there are no residences within 200 feet of on-site contamination. The site serves as an industrial park and has little or no recreational value. EBI maintains 20 workers on-site. The residents of Houma living within 1 mile of the site were scored as nearby individuals. The most important factors considered for the soil exposure pathway are as follows:

- The pits are accessible and there is a residential population within the nearby vicinity. However, no recreational activities were documented on-site.

- Several on-site workers are present in the industrial park.

Air Pathway

The air pathway was not evaluated as part of the Phase III effort due to lack of data; however, during the SIP quantitative air monitoring, no readings were measured at levels above background concentrations in the breathing space around the pits. Readings taken near the surface of the pits did exceed background concentrations.

Data Gaps

WESTON identified several data gaps during the file review and PREscore evaluation. Some of these data gaps were filled (as directed by EPA VI) during Phase III data collection; however, additional data gaps remain and may significantly affect the site score. The most critical remaining data gaps include the following:

- Additional analytical data to indicate if hazardous materials present at the site are releasing to Bayou La Carpe and the Houma Navigational Canal.
- Additional analytical data to determine if hazardous materials are affecting the Houma Water Plant.
- Additional investigation of the sensitive environments associated with the surface water pathway and an accurate delineation of the upstream TDL.

CONCLUSIONS

The DS site is an inactive barge cleaning, repairing, and gas-freeing operation located on the southern side of Houma, in Terrebonne Parish, Louisiana. The DS site operated as a barge cleaning, repairing, and gas-freeing facility for an undetermined period of time prior to 1986 when EBI bought the site.

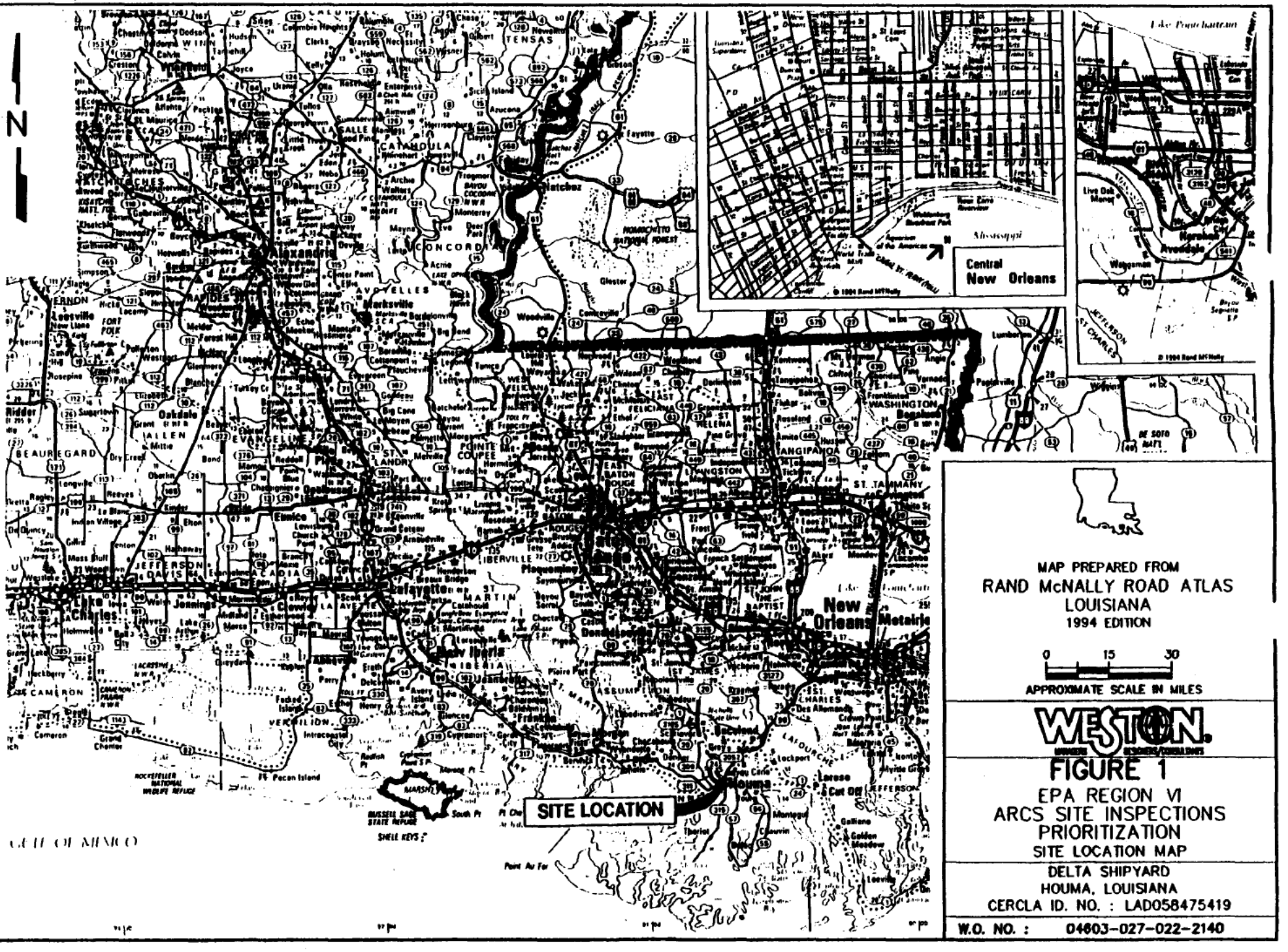
Concerns associated with the migration of hazardous constituents from the site and exposure pathways are summarized as follows:

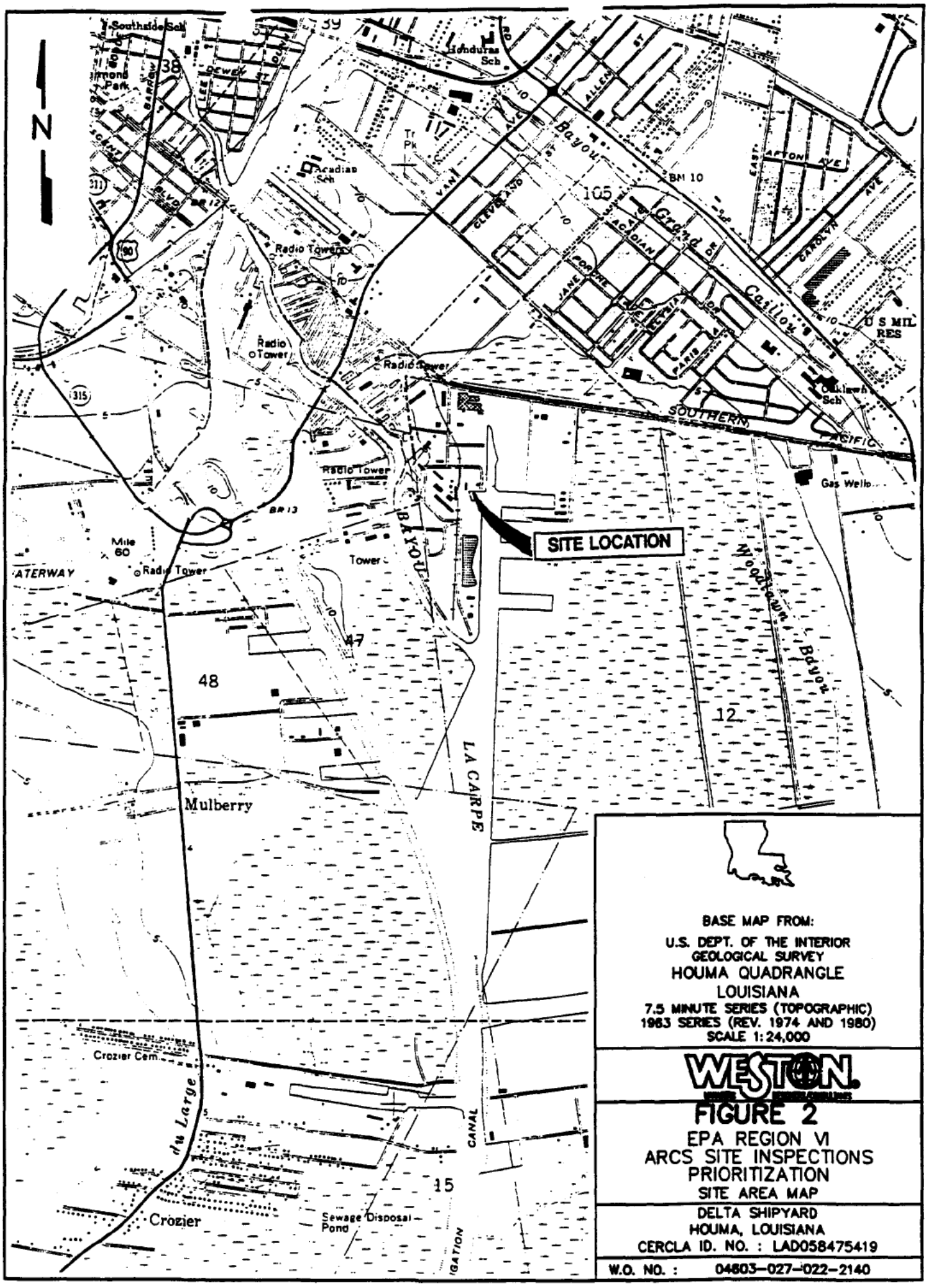
- Based on the information presented in the Groundwater Pathway section, a release of hazardous constituents to groundwater is of little concern. A release to groundwater has not been documented, the subsurface soils are relatively impermeable, and no groundwater use has been identified in the vicinity of the site.
- Based on the information presented in the Surface Water Pathway section, a release of hazardous constituents to surface water is of concern. Several hazardous constituents were detected in the drainage ditch leading to Bayou La Carpe. The Houma Water Plant surface water intake and several miles of wetlands frontage are located within the TDL.

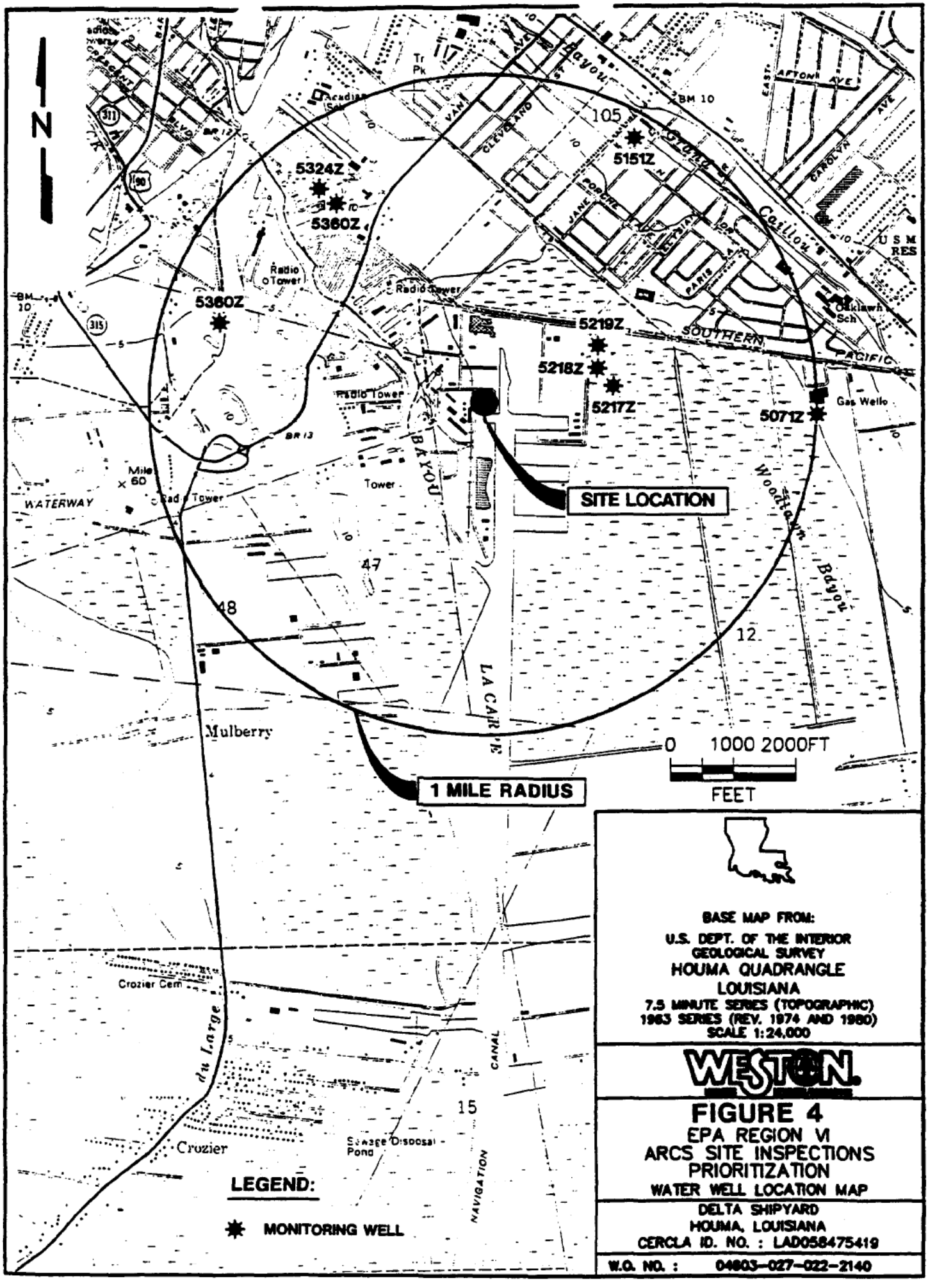
- Based on the information presented in the Soil Exposure Pathway section, a release of hazardous constituents is of concern because several semivolatile organics, pesticides, and heavy metals have been detected in the on-site pits at levels significantly above background concentrations. Soil exposure targets include the on-site workers and the nearby population.

- Based on the information presented in the Air Pathway section, the air pathway is of no concern because the barge cleaning, repairing, and gas-freeing facility is no longer active.

The individual pathways with the greatest influence on the HRS score were surface water and soil exposure pathways.


N
Central
New Orleans
SITE LOCATION
GULF OF MEXICO
MAP PREPARED FROM
RAND McNALLY ROAD ATLAS
LOUISIANA
1994 EDITION
0 15 30
APPROXIMATE SCALE IN MILES
WESTON
FIGURE 1
EPA REGION VI
ARCS SITE INSPECTIONS
PRIORITIZATION
SITE LOCATION MAP
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419
W.O. NO. : 04603-027-022-2140


N
SITE LOCATION
Bayou
LA CARPE
Mulberry
Crozier
Crozier Cem.
du Large
Sewage Disposal Pond
Radio Tower
Mile 60
ATERWAY
Southside Sch
Honduras Sch
Acadian Sch
Oaklawn Sch
Gas Wells
SOUTHERN PACIFIC
Woodtown Bayou
CANAL
IGATION
BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
HOUMA QUADRANGLE
LOUISIANA
7.5 MINUTE SERIES (TOPOGRAPHIC)
1963 SERIES (REV. 1974 AND 1980)
SCALE 1: 24,000
WESTON
FIGURE 2
EPA REGION VI
ARCS SITE INSPECTIONS
PRIORITIZATION
SITE AREA MAP
DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419
W.O. NO. : 04803-027-022-2140



BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
HOUMA QUADRANGLE
LOUISIANA
7.5 MINUTE SERIES (TOPOGRAPHIC)
1963 SERIES (REV. 1974 AND 1980)
SCALE 1:24,000

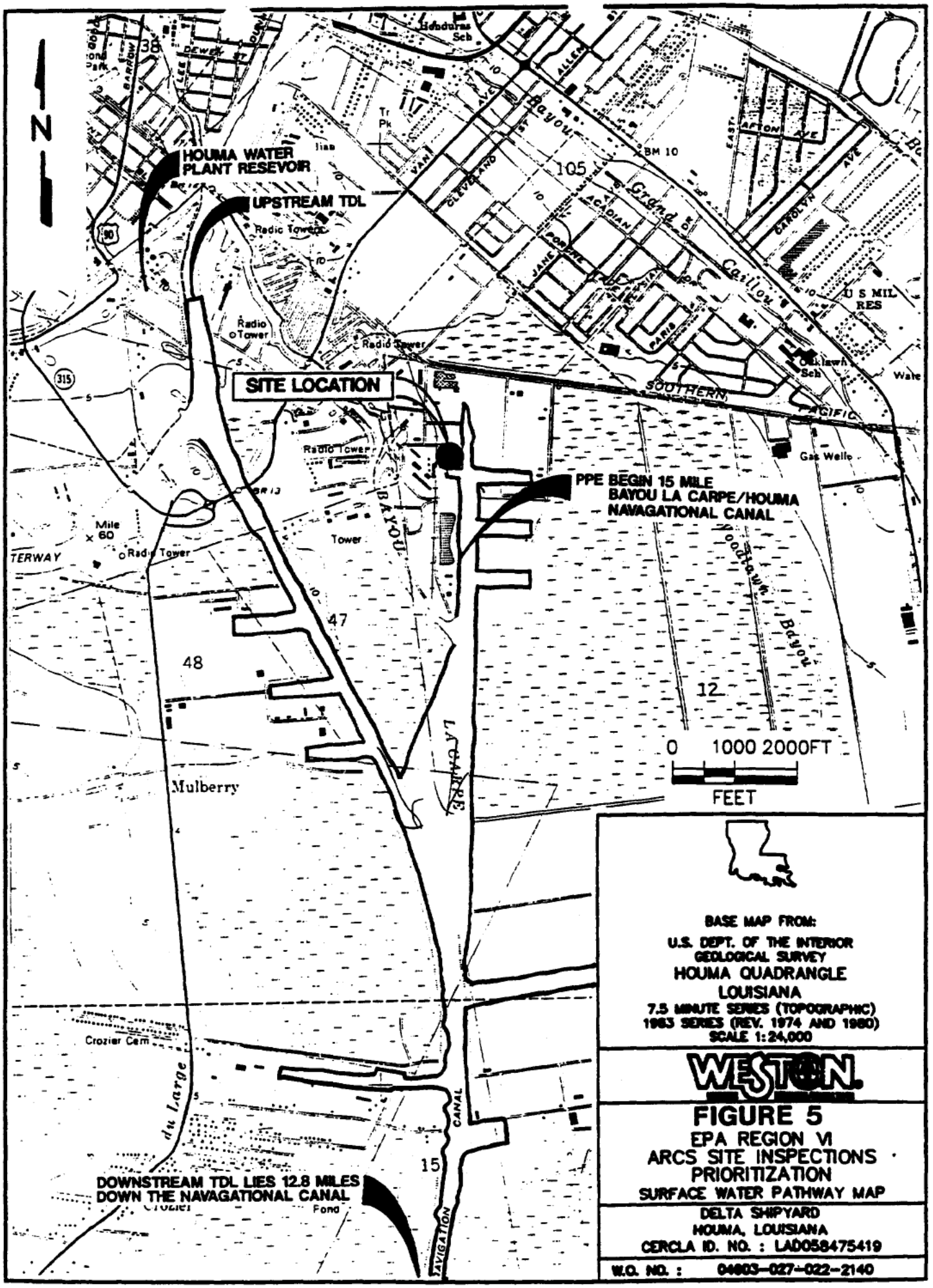
WESTON

FIGURE 4

EPA REGION VI
ARCS SITE INSPECTIONS
PRIORITIZATION
WATER WELL LOCATION MAP

DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419

W.O. NO. : 04803-027-022-2140



BASE MAP FROM:
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
HOUMA QUADRANGLE
LOUISIANA
7.5 MINUTE SERIES (TOPOGRAPHIC)
1983 SERIES (REV. 1974 AND 1980)
SCALE 1:24,000

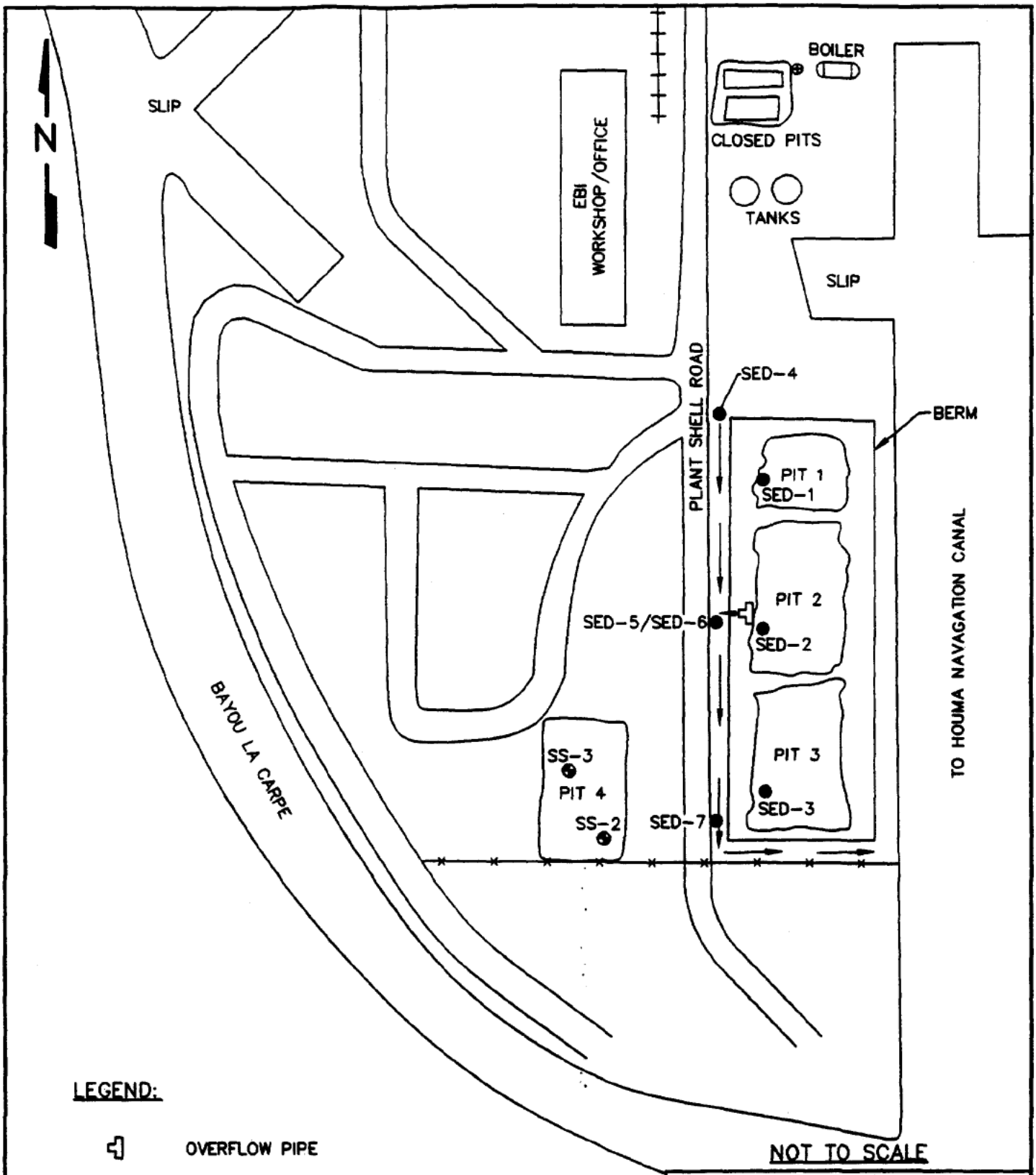
WESTON

FIGURE 5

EPA REGION VI
ARCS SITE INSPECTIONS PRIORITIZATION
SURFACE WATER PATHWAY MAP

DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419

W.O. NO. : 04803-027-022-2140



NOTE

SS-1 IS TAKEN OFFSITE AS A BACKGROUND SAMPLE.

WESTON

FIGURE 6

EPA REGION VI
ARCS SITE INSPECTIONS
PRIORITIZATION
SAMPLE LOCATION MAP

DELTA SHIPYARD
HOUMA, LOUISIANA
CERCLA ID. NO. : LAD058475419

W.O. NO. : 04803-027-022-2140

PCP-I: \ARCS\ARC2722\ARCS

I: \ARCS\ARC2722\2140.PA.RF 11-28-94 1=1

REFERENCE 1-NOT USED

REFERENCE 2-NOT USED

REFERENCE 3-NOT USED

REFERENCE 4-NOT USED

REFERENCE 5

3012 Site

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT

REGION	SITE NUMBER (to be assigned by HQ)
VI	LA 01317

GENERAL INSTRUCTIONS: Complete Sections I and III through XV of this form as completely as possible. Then use the information on this form to develop a Tentative Disposition *(Section II)*. File this form in its entirety in the regional Hazardous Waste Log File. Be sure to include all appropriate Supplemental Reports in the file. Submit a copy of the forms to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force *(EN-335)*; 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME	B. STREET (or other identifier)		
Delta Shipyard	202 Industrial Boulevard		
C. CITY	**D. STATE**	**E. ZIP CODE**	**F. COUNTY NAME**
Houma	LA	70361	Terrebonne

G. SITE OPERATOR INFORMATION

1. NAME	2. TELEPHONE NUMBER		
Ralph Arceneaux, President Delta Shipyard	(504) 868-7450		
3. STREET	**4. CITY**	**5. STATE**	**6. ZIP CODE**
P.O. Box 101	Houma	LA	70361

H. REALTY OWNER INFORMATION *(if different from operator of site)*

1. NAME	2. TELEPHONE NUMBER		
Delta Services Industries	(504) 868-7450		
3. CITY	**4. STATE**	**5. ZIP CODE**	
Houma (P.O. Box 101)	LA	70361	

I. SITE DESCRIPTION

see attachment

J. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☒ 5. PRIVATE

II. TENTATIVE DISPOSITION *(complete this section last)*

A. ESTIMATE DATE OF TENTATIVE DISPOSITION (mo., day, & yr.)	B. APPARENT SERIOUSNESS OF PROBLEM
	☐ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☒ 4. NONE

C. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE (mo., day, & yr.)
Thomas Myers	(201) 560-1650	9/12/84

III. INSPECTION INFORMATION

A. PRINCIPAL INSPECTOR INFORMATION

1. NAME	2. TITLE	
Thomas Myers	Geologist	
3. ORGANIZATION	**4. TELEPHONE NO. (area code & no.)**	
The Earth Technology Corporation	(201) 560-1650	

B. INSPECTION PARTICIPANTS

1. NAME	2. ORGANIZATION	3. TELEPHONE NO.
None		

C. SITE REPRESENTATIVES INTERVIEWED *(corporate officials, workers, residents)*

1. NAME	2. TITLE & TELEPHONE NO.	3. ADDRESS
Ralph Arceneaux	President (504) 868-7450	P.O. Box 101, Houma, LA 70361

SUPERFUND FILE

APR 30 1992

REORGANIZED

LAD 058 475 419

Reviewed by 6AW-SC 12/16/94

Continued From Front

III. INSPECTION INFORMATION (continued)

D. GENERATOR INFORMATION (sources of waste)

1. NAME	2. TELEPHONE NO.	3. ADDRESS	4. WASTE TYPE GENERATED
Delta Shipyard	(504) 868-7450	P.O. Box 101, Houma, LA 70361	oily waste-recovered and sold to recyclers

E. TRANSPORTER/HAULER INFORMATION

1. NAME	2. TELEPHONE NO.	3. ADDRESS	4. WASTE TYPE TRANSPORTED
None			

F. IF WASTE IS PROCESSED ON SITE AND ALSO SHIPPED TO OTHER SITES, IDENTIFY OFF-SITE FACILITIES USED FOR DISPOSAL.

1. NAME	2. TELEPHONE NO.	3. ADDRESS
None		

G. DATE OF INSPECTION (mo., day, & yr.)	H. TIME OF INSPECTION	I. ACCESS GAINED BY: (credentials must be shown in all cases)
9/12/84	1:30-4:00	[X] 1. PERMISSION [ ] 2. WARRANT

J. WEATHER (describe)

sunny, high in the 90's

IV. SAMPLING INFORMATION

A. Mark 'X' for the types of samples taken and indicate where they have been sent e.g., regional lab, other EPA lab, contractor, etc. and estimate when the results will be available.

1. SAMPLE TYPE	2. SAMPLE TAKEN (mark 'X')	3. SAMPLE SENT TO:	4. DATE RESULTS AVAILABLE
a. GROUNDWATER			
b. SURFACE WATER			
c. WASTE			
d. AIR			
e. RUNOFF			
f. SPILL			
g. SOIL			
h. VEGETATION			
i. OTHER (specify) None		see attachment	

B. FIELD MEASUREMENTS TAKEN (e.g., radioactivity, explosivity, PH, etc.)

1. TYPE	2. LOCATION OF MEASUREMENTS	3. RESULTS
None		

Continued From Page 2

IV. SAMPLING INFORMATION (continued)

C. PHOTOS

1. TYPE OF PHOTOS: [XX] a. GROUND [ ] b. AERIAL
2. PHOTOS IN CUSTODY OF: see attachment

D. SITE MAPPED?

[XX] YES. SPECIFY LOCATION OF MAPS: see attachment

E. COORDINATES

1. LATITUDE (deg.-min.-sec.): 29° 34' 02" N
2. LONGITUDE (deg.-min.-sec.): 90° 42' 18" W

V. SITE INFORMATION

A. SITE STATUS

[ ] 1. ACTIVE (Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if intrequently.)

[X] 2. INACTIVE (Those sites which no longer receive wastes.) 2 closed oil pits

[ ] 3. OTHER (specify): _____ (Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)

B. IS GENERATOR ON SITE?

[ ] 1. NO [X] 2. YES (specify generator's four-digit SIC Code): None

C. AREA OF SITE (in acres): 36

D. ARE THERE BUILDINGS ON THE SITE?

[ ] 1. NO [X] 2. YES (specify): Office and administration building

VI. CHARACTERIZATION OF SITE ACTIVITY

Indicate the major site activity(ies) and details relating to each activity by marking 'X' in the appropriate boxes.

	A. TRANSPORTER		B. STORER		C. TREATER		D. DISPOSER
	1. RAIL		1. PILE		1. FILTRATION		1. LANDFILL
	2. SHIP		2. SURFACE IMPOUNDMENT		2. INCINERATION		2. LANDFARM
	3. BARGE		3. DRUMS		3. VOLUME REDUCTION		3. OPEN DUMP
	4. TRUCK		4. TANK, ABOVE GROUND		4. RECYCLING/RECOVERY	X	4. SURFACE IMPOUNDMENT
	5. PIPELINE		5. TANK, BELOW GROUND		5. CHEM./PHYS./TREATMENT		5. MIDNIGHT DUMPING
	6. OTHER (specify):		6. OTHER (specify):		6. BIOLOGICAL TREATMENT		6. INCINERATION
					7. WASTE OIL REPROCESSING		7. UNDERGROUND INJECTION
					8. SOLVENT RECOVERY		8. OTHER (specify):
					9. OTHER (specify):		(closed under LA DEQ supervision)

E. SUPPLEMENTAL REPORTS: If the site falls within any of the categories listed below, Supplemental Reports must be completed. Indicate which Supplemental Reports you have filled out and attached to this for..

[ ] 1. STORAGE [ ] 2. INCINERATION [ ] 3. LANDFILL [X] 4. SURFACE IMPOUNDMENT [ ] 5. DEEP WELL

[ ] 6. CHEM/BIO/PHYS TREATMENT [ ] 7. LANDFARM [ ] 8. OPEN DUMP [ ] 9. TRANSPORTER [ ] 10. RECYCLOR/RECLAIMER

VII. WASTE RELATED INFORMATION

A. WASTE TYPE

[XX] 1. LIQUID [ ] 2. SOLID [ ] 3. SLUDGE [ ] 4. GAS

B. WASTE CHARACTERISTICS

[ ] 1. CORROSIVE [ ] 2. IGNITABLE [ ] 3. RADIOACTIVE [ ] 4. HIGHLY VOLATILE

[XX] 5. TOXIC [ ] 6. REACTIVE [ ] 7. INERT [X] 8. FLAMMABLE

[ ] 9. OTHER (specify):

C. WASTE CATEGORIES

1. Are records of wastes available? Specify items such as manifests, inventories, etc. below.

Yes, manifests.

 Continue On Reverse

Continued From Front

VII. WASTE RELATED INFORMATION (continued)

2. Estimate the amount (specify unit of measure) of waste by category; mark 'X' to indicate which wastes are present.

a. SLUDGE	b. OIL	c. SOLVENTS	d. CHEMICALS	e. SOLIDS	f. OTHER
AMOUNT: None	AMOUNT: 125	AMOUNT: None	AMOUNT: None	AMOUNT: None	AMOUNT: None
UNIT OF MEASURE:	UNIT OF MEASURE: bbl /month	UNIT OF MEASURE:	UNIT OF MEASURE:	UNIT OF MEASURE:	UNIT OF MEASURE:
(1) PAINT. PIGMENTS	X (1) OILY WASTES	(1) HALOGENATED SOLVENTS	(1) ACIDS	(1) FLYASH	(1) LABORATORY. PHARMACEUT.
(2) METALS SLUDGES	X (2) OTHER (specify): Leaded tank bottoms	(2) NON-HALOGNTD. SOLVENTS	(2) PICKLING LIQUORS	(2) ASBESTOS	(2) HOSPITAL
(3) POTW	NOTE: all waste oil is sold to re-claimers	(3) OTHER (specify):	(3) CAUSTICS	(3) MILLING/MINE TAILINGS	(3) RADIOACTIVE
(4) ALUMINUM SLUDGE			(4) PESTICIDES	(4) FERROUS SMELTING WASTES	(4) MUNICIPAL
(5) OTHER (specify):			(5) DYES/INKS	(5) NON-FERROUS SMLTG. WASTES	(5) OTHER (specify):
			(6) CYANIDE	(6) OTHER (specify):	
			(7) PHENOLS		
			(8) HALOGENS		
			(9) PCB		
			(10) METALS		
			(11) OTHER (specify):		

D. LIST SUBSTANCES OF GREATEST CONCERN WHICH ARE ON THE SITE (place in descending order of hazard)

1. SUBSTANCE	2. FORM (mark 'X') a. SOLID	b. LIQ.	c. VAPOR	3. TOXICITY (mark 'X') a. HIGH	b. MED.	c. LOW	d. NONE	4. CAS NUMBER	5. AMOUNT	6. UNIT
Leaded tank bottoms	X	X		X				68476-53-9	62.5	bbl/mo
Slop oil		X			X			68477-26-9	62.5	bbl/mo

VIII. HAZARD DESCRIPTION

FIELD EVALUATION HAZARD DESCRIPTION: Place an 'X' in the box to indicate that the listed hazard exists. Describe the hazard in the space provided.

☐ A. HUMAN HEALTH HAZARDS

Continued From Page 4

VIII. HAZARD DESCRIPTION (continued)

☐ B. NON-WORKER INJURY/EXPOSURE

☐ C. WORKER INJURY/EXPOSURE

☐ D. CONTAMINATION OF WATER SUPPLY

☐ E. CONTAMINATION OF FOOD CHAIN

☐ F. CONTAMINATION OF GROUND WATER

☐ G. CONTAMINATION OF SURFACE WATER

Continued From Front

VIII. HAZARD DESCRIPTION (continued)

☐ H. DAMAGE TO FLORA/FAUNA

☐ I. FISH KILL

☐ J. CONTAMINATION OF AIR

☐ K. NOTICEABLE ODORS

☐ L. CONTAMINATION OF SOIL

☐ M. PROPERTY DAMAGE

Continue On Page 7

Continued From Page 6

VIII. HAZARD DESCRIPTION (continued)

☐ N. FIRE OR EXPLOSION

☐ O. SPILLS/LEAKING CONTAINERS/RUNOFF/STANDING LIQUID

☐ P. SEWER, STORM DRAIN PROBLEMS

☐ Q. EROSION PROBLEMS

☐ R. INADEQUATE SECURITY

☐ S. INCOMPATIBLE WASTES

VIII. HAZARD DESCRIPTION (continued)

☐ T. MIDNIGHT DUMPING

☐ U. OTHER (specify):

IX. POPULATION DIRECTLY AFFECTED BY SITE

A. LOCATION OF POPULATION	B. APPROX. NO. OF PEOPLE AFFECTED	C. APPROX. NO. OF PEOPLE AFFECTED WITHIN UNIT AREA	D. APPROX. NO. OF BUILDINGS AFFECTED	E. DISTANCE TO SITE (specify units)
1. IN RESIDENTIAL AREAS	1,000	1,000	300	1 mile
2. IN COMMERCIAL OR INDUSTRIAL AREAS	2,500	2,500	25	1 mile
3. IN PUBLICLY TRAVELLED AREAS	0	0	0	1 mile
4. PUBLIC USE AREAS (parks, schools, etc.)	0	0	0	1 mile

X. WATER AND HYDROLOGICAL DATA

A. DEPTH TO GROUNDWATER (specify unit)	B. DIRECTION OF FLOW	C. GROUNDWATER USE IN VICINITY
2 feet	South	None
D. POTENTIAL YIELD OF AQUIFER	**E. DISTANCE TO DRINKING WATER SUPPLY (specify unit of measure)**	**F. DIRECTION TO DRINKING WATER SUPPLY**
Unknown	0.5 miles	West

G. TYPE OF DRINKING WATER SUPPLY

☐ 1. NON-COMMUNITY < 15 CONNECTIONS ☒ 2. COMMUNITY (specify town): Houma Water Dept. - Bayou Black > 15 CONNECTIONS

☒ 3. SURFACE WATER ☐ 4. WELL

Continue On Page 9

Continued From Page 8

X. WATER AND HYDROLOGICAL DATA (continued)

H. LIST ALL DRINKING WATER WELLS WITHIN A 1/4 MILE RADIUS OF SITE

1. WELL	2. DEPTH (specify unit)	3. LOCATION (proximity to population/buildings)	4. NON-COMMUNITY (mark 'X')	5. COMMUNITY (mark 'X')
None				

I. RECEIVING WATER

1. NAME: Houma Navigation Canal

☐ 2. SEWERS ☒ 3. STREAMS/RIVERS ☐ 4. LAKES/RESERVOIRS ☐ 5. OTHER (specify):

6. SPECIFY USE AND CLASSIFICATION OF RECEIVING WATERS

Secondary contact recreation and propagation of fish and wildlife.

XI. SOIL AND VEGITATION DATA

LOCATION OF SITE IS IN:

☐ A. KNOWN FAULT ZONE ☐ B. KARST ZONE ☒ C. 100 YEAR FLOOD PLAIN ☐ D. WETLAND

☐ E. A REGULATED FLOODWAY ☐ F. CRITICAL HABITAT ☐ G. RECHARGE ZONE OR SOLE SOURCE AQUIFER

XII. TYPE OF GEOLOGICAL MATERIAL OBSERVED

Mark 'X' to indicate the type(s) of geological material observed and specify where necessary, the component parts.

*X	A. OVERBURDEN	*X	B. BEDROCK (specify below)	*X	C. OTHER (specify below)
	1. SAND				
X	2. CLAY				
	3. GRAVEL				

XIII. SOIL PERMEABILITY

☐ A. UNKNOWN ☐ B. VERY HIGH (100,000 to 1000 cm/sec.) ☐ C. HIGH (1000 to 10 cm/sec.)

☐ D. MODERATE (10 to .1 cm/sec.) ☐ E. LOW (.1 to .001 cm/sec.) ☒ F. VERY LOW (.001 to .00001 cm/sec.)

G. RECHARGE AREA

☐ 1. YES ☒ 2. NO 3. COMMENTS:

H. DISCHARGE AREA

☐ 1. YES ☒ 2. NO 3. COMMENTS:

I. SLOPE

1. ESTIMATE % OF SLOPE	2. SPECIFY DIRECTION OF SLOPE, CONDITION OF SLOPE, ETC.
0%	South

J. OTHER GEOLOGICAL DATA

Fresh water may be contained in buried distributary channels along Bayou Lafourche but any development of these reservoirs would be very limited due to salt water encroachment. Pleistocene terrace deposits beneath these Holocene deltaic sequences are connected to surface waters and any contamination of these aquifers could reach surface reservoirs.

 Continue On Reverse

Continued From Front

XIV. PERMIT INFORMATION

List all applicable permits held by the site and provide the related information.

A. PERMIT TYPE (e.g., RCRA, State, NPDES, etc.)	B. ISSUING AGENCY	C. PERMIT NUMBER	D. DATE ISSUED (mo., day, & yr.)	E. EXPIRATION DATE (mo., day, & yr.)	F. IN COMPLIANCE (mark 'X')		
					1. YES	2. NO	3. UNKNOWN
State	HWMP	GD 343I1	10/22/80	Interim	X		
RCRA	EPA	LAD 058473413	Unknown	None	X		

XV. PAST REGULATORY OR ENFORCEMENT ACTIONS

☒ NONE ☐ YES (summarize in this space)

NOTE: Based on the information in Sections III through XV, fill out the Tentative Disposition *(Section II)* information on the first page of this form.

ATTACHMENT A

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT SUPPLEMENT SHEET

LA 01317

Instruction - This sheet is provided to give additional information in explanation of a question on the form T2070-3.

Corresponding number on form	Additional Remark and/or Explanation
I., I.	This facility cleans and repairs oil barges. Two oil/water separator pits were utilized to recover the waste oil generated from the barge cleaning operations. Earlier this year the pits were drained and the bottom sludge was sampled. The test results from this sampling were reviewed by the LA DEQ Hazardous Waste Division, and closure of the pits by backfilling was approved. The oil sludge remaining in the pits was mixed with 30 cubic yards of sandy soil. An above ground steel tank separator has replaced the pits.
IV., A., i.	Since closure of the pits was approved by the State Hazardous Waste Division, no samples will be collected.

LA01317

ATTACHMENT B

REJECTION FORM

HAZSIT #	SITE NAME	FORM # and DATE COMPLETED by STATE
LA 1317	Delta Shipyard	2070-3 / 9/12/84

EXPLANATION FOR REJECTION:
(DEFICIENCIES)

* Report does not reflect the existence of the two monitoring wells other than a site map.
  - If well samples were taken during the time of the State-approved closure, provide this data and any other data pertinent to site closure. ⊙ Review State files.

* VICINITY MAP EXHIBIT "B" is very poor in quality.

SUGGESTED REMEDY FOR DEFICIENCIES:

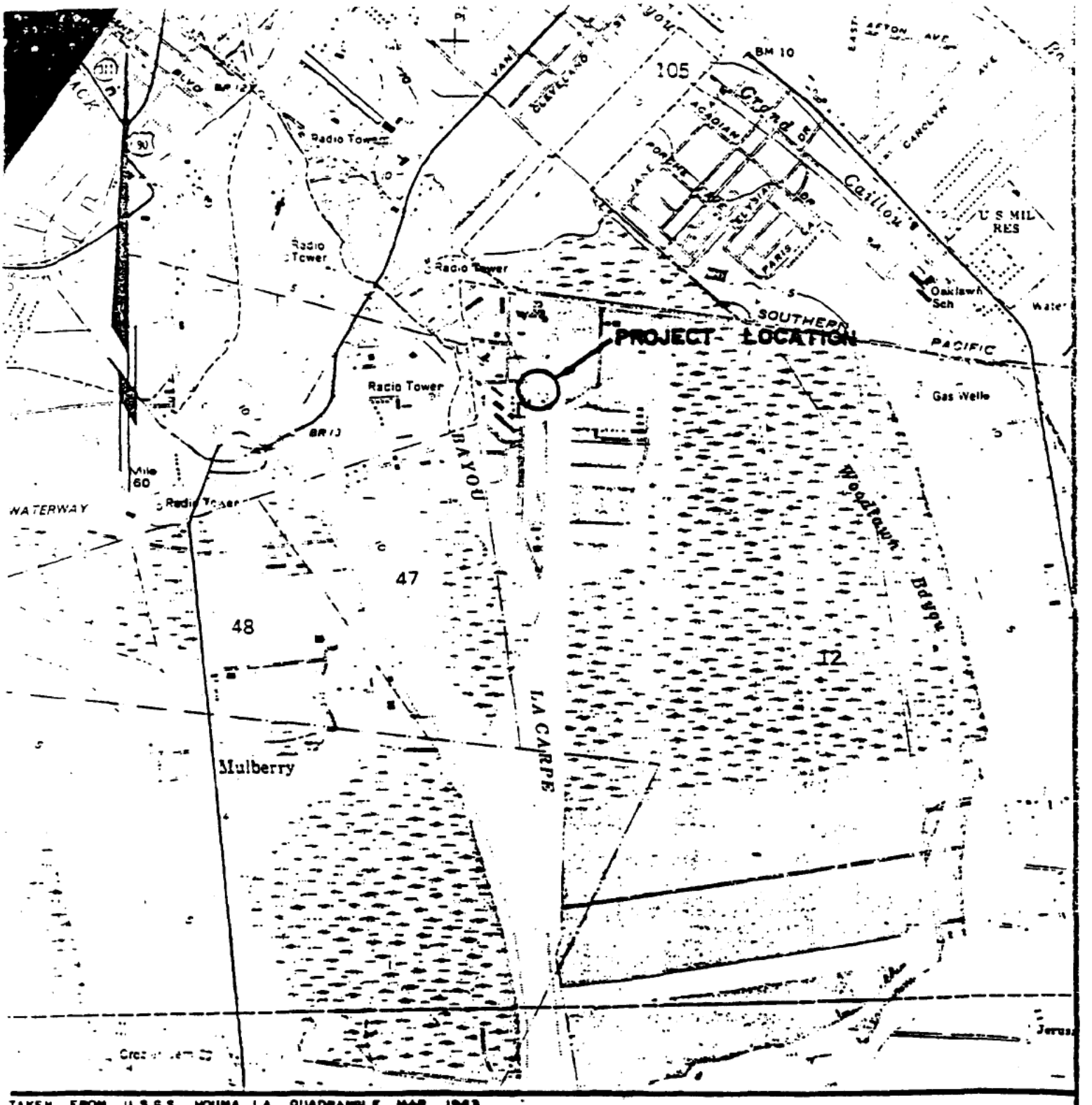
As noted.

Provide a superior reproduction or a different map of sufficient quality. (must be able to read elevations)
⊙ Contact U.S.G.S. or L.G.S. for assistance.

SIGNATURE: Gary W. Glenn

DATE: 18DEC84

NAME OF REVIEWER

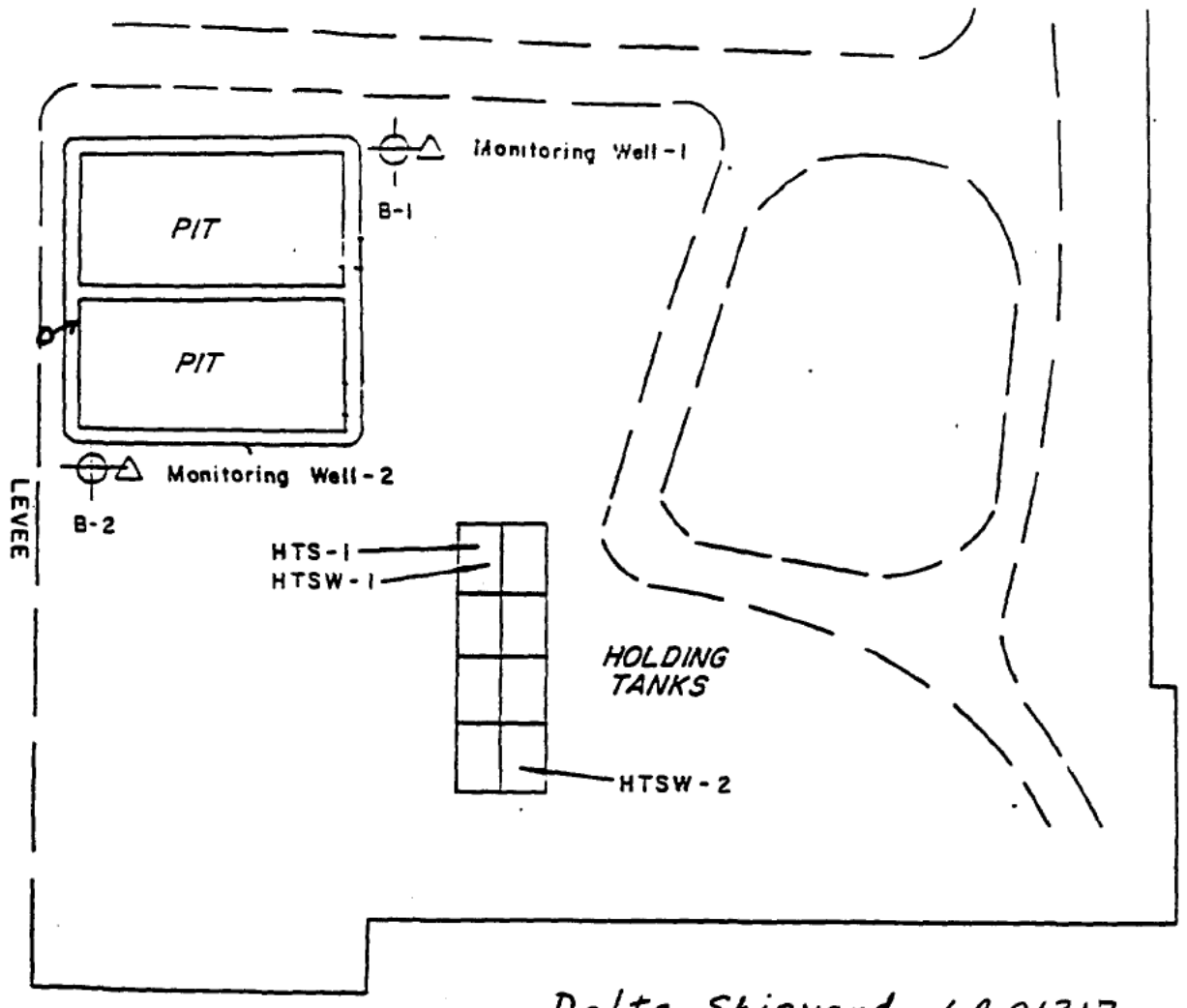


TAKEN FROM U.S.G.S. HOUMA, LA. QUADRANGLE MAP, 1963.

SCALE IN FEET

1000 0 1000 2000 3000 4000 5000 6000 7000

VICINITY MAP
EXHIBIT "B"



Delta Shipyard LA 01317

Site Map

MONITORING WELLS
B-1 (3" by 13')
B-2 (3" by 20')

3 Photograph Location and direction

SURFACE IMPOUNDMENTS SITE INSPECTION REPORT
(Supplemental Report) LA 01317

INSTRUCTION
Answer and Explain as Necessary.

1. TYPE OF IMPOUNDMENT
Two secondary oil/water separator pits.

2. STABILITY/CONDITION OF EMBANKMENTS
The pits have been backfilled and closed.

3. EVIDENCE OF SITE INSTABILITY *(Erosion, Settling, Sink Holes, etc.)*
☐ YES ☒ NO

4. EVIDENCE OF DISPOSAL OF IGNITABLE OR REACTIVE WASTE
☐ YES ☒ NO

5. ONLY COMPATIBLE WASTES ARE STORED OR DISPOSED OF IN THE IMPOUNDMENT
☒ YES ☐ NO

6. RECORDS CHECKED FOR CONTENTS AND LOCATION OF EACH SURFACE IMPOUNDMENT
☒ YES ☐ NO

7. IMPOUNDMENT HAS LINER SYSTEM
☒ YES ☐ NO located in clay soil

7a. INTEGRITY OF LINER SYSTEM CHECKED
☐ YES ☒ NO

7b. FINDINGS
Subsurface soils have a permeability of 10^{-7} to 10^{-8} cm/sec.

8. SOIL STRUCTURE AND SUBSTRUCTURE
Silty clay with traces of sand extend to a depth of 40-50 feet.

9. MONITORING WELLS
☒ YES ☐ NO 2 wells, B-1 is 13 feet deep and B-2 is 20 feet deep.

10. LENGTH, WIDTH, AND DEPTH
LENGTH 75' (each) WIDTH 40' (each) DEPTH 5' (each)

11. CALCULATED VOLUMETRIC CAPACITY
15,000 cubic feet

12. PERCENT OF CAPACITY REMAINING
Closed pits - N/A

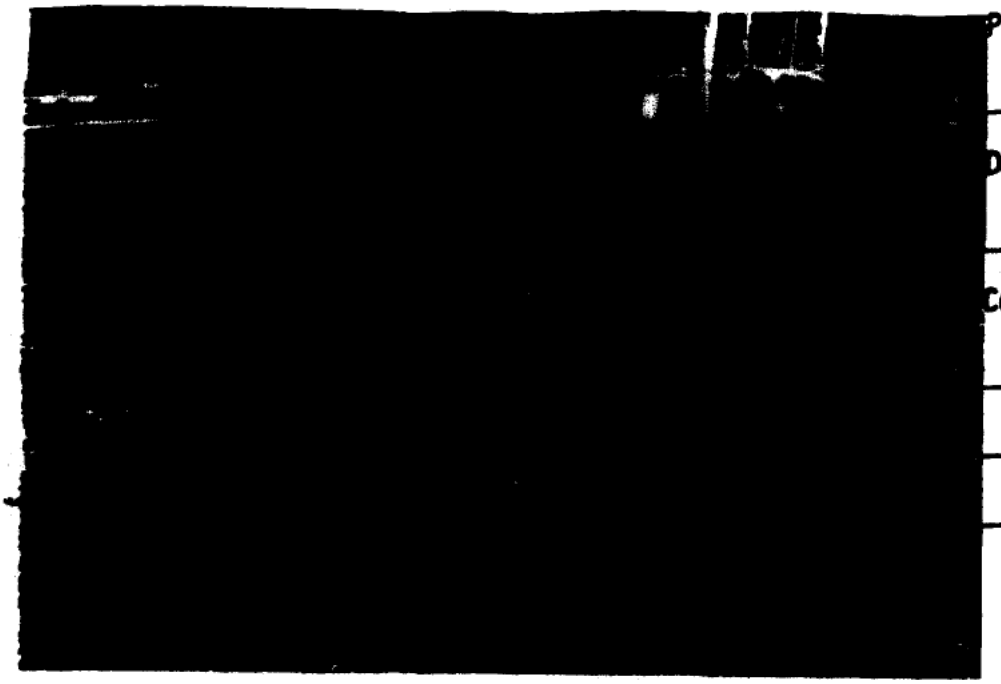
13. ESTIMATE FREEBOARD
N/A

14. SOLIDS DEPOSITION
☒ YES ☐ NO Low solids deposited

15. DREDGING DISPOSAL METHOD
None

16. OTHER EQUIPMENT
None

[illegible] Shipyard
LA 01317



Photographer / Witness

Thomas Myers

Date / Time / Direction

9/12/84, 3:00pm, Northeast

Comments: closed oil/water separator pits

Photographer / Witness

Date / Time / Direction

Comments:

Photographer / Witness

Date / Time / Direction

Comments:

REFERENCE 6

WINK ENGINEERING
A DIVISION OF WINK INCORPORATED

MECHANICAL
CIVIL
ELECTRICAL
PROCESS
INSTRUMENT

7520 HAYNE BLVD ■ NEW ORLEANS, LA 70126-1899 ■ TELEPHONE 504/240-7924

JULY 5, 1985

MR. GLENN A. MILLER
ADMINISTRATOR
LOUISIANA DEPARTMENT OF
ENVIRONMENTAL QUALITY
P.O. BOX 44066
BATON ROUGE, LA 70804

LETTER NO.: WM59-5
RE: DELTA SHIPYARD'S WASTE SITES AT HOUMA & DUSON, LOUISIANA
WINK JOB NO.: 59-051485

DEAR MR. MILLER:

THIS LETTER AND ITS ATTACHMENTS ARE PREPARED PURSUANT TO MY TELEPHONE CONVERSATIONS ON JUNE 5, 1985, WITH MESSRS. DUDLEY DEVILLE AND TOM PATTERSON OF YOUR OFFICE. WINK, INC., AN INDEPENDENT CONSULTING ENGINEERING FIRM, HAS BEEN RETAINED TO DETERMINE IF THE ABOVE REFERENCED SITES ARE HAZARDOUS.

[redacted] AT THE DUSON YARD THERE IS A SUBMERGED, UNCOVERED STEEL TANK FILLED WITH A LIQUID SUBSTANCE. ACCORDING TO OUR RESEARCH, ALL SITES WERE ONCE USED TO DISPOSE OF OIL FIELD DRILLING MATERIAL. THIS PRACTICE CEASED ABOUT 10 YEARS AGO; HOWEVER, IT APPEARS FROM OUR ANALYSIS DUMPING HAS OCCURRED INTERMITTENTLY SINCE THEN. SEVERAL SURFACE SPILLS WERE OBSERVED ON THESE PROPERTIES AND A CHEMICAL ANALYSIS WAS SUBSEQUENTLY MADE.

AT ONE TIME THE SURFACE IMPOUNDMENTS AT HOUMA WERE REGISTERED WITH THE DEPARTMENT OF ENVIRONMENTAL QUALITY AS HAZARDOUS WASTE SITES, BUT WERE RECOMMENDED BY YOUR ENFORCEMENT AGENCY IN JANUARY, 1984, TO BE REMOVED FROM THE HAZARDOUS WASTE SYSTEM. CURRENTLY, THESE IMPOUNDMENTS ARE IN THE INACTIVE CLASSIFICATION AS CONFIRMED BY TELEPHONE ON JUNE 5, 1985. TO DETERMINE THE SLUDGE AND LIQUID CHEMICAL COMPOSITION AND THEREFORE THE POTENTIALLY HAZARDOUS NATURE OF THESE SITES, NUMEROUS SAMPLES WERE COLLECTED AT RANDOM LOCATIONS AS INDICATED IN ATTACHMENTS 1, 2, 3, 4, & 5. IMPOUNDMENTS 1, 2, 3 IN HOUMA ARE COVERED WITH A THIN CRUST OF FILL WHILE NOS. 5, 6, 7 ARE EXPOSED. HOUMA AREA NO. 4 AND DUSON AREA NOS. 2 & 3 ARE ESSENTIALLY LOW SPOTS WHERE ACCUMULATIONS OF SLUDGE HAVE SETTLED. DUSON AREA NO. 1 CONSISTS OF A SUBMERGED STEEL TANK OF UNKNOWN DEPTH CONTAINING A LIQUID SUBSTANCE. SOIL SAMPLES WERE TAKEN AT VARIOUS DEPTHS APPROXIMATELY 8" FROM THE SUBMERGED TANK TO CHECK FOR LEAKAGE.

ALL INDIVIDUAL SAMPLES FROM EACH IMPOUNDMENT/AREA WERE THOROUGHLY MIXED TO FORM A COMPOSITE SAMPLE FOR EACH LOCATION. LABORATORY ANALYSES WERE PERFORMED BY WEST-PAINE OF BATON ROUGE, AND THE RESULTS ARE CONTAINED IN ATTACHMENT NO. 6.

THE FOLLOWING TESTS WERE PERFORMED ON EACH SAMPLE: VOA (VOLATILE ORGANIC AROMATICS), CYANIDE, PHENOL (TOTAL), FLASH POINT (BELOW 140^{0}F), PH, EP TOXICITY, AND OIL & GREASE. BASED ON THE ATTACHED ANALYSES, THE EP TOXICITY CONSTITUENTS DO NOT EXCEED THOSE LIMITS DESCRIBED IN CHAPTER 24, TABLE 5. NEITHER DO THE SUMMATION OF CONSTITUENTS LISTED IN PARAGRAPHS 24.1 (D) AND (E) AND CHAPTER 17 EXCEED 1000 PPM. IT IS OUR OPINION THAT THESE SITES ARE NOT TO BE CONSIDERED HAZARDOUS AND WILL NOT NOW OR IN THE FUTURE POSE A THREAT TO HUMAN HEALTH OR THE ENVIRONMENT.

IF YOUR OFFICE IS IN AGREEMENT THAT THESE FACILITIES ARE NOT HAZARDOUS, PLEASE FURNISH THE NECESSARY DOCUMENTS TO AUTHORIZE DECLASSIFICATION OR CONFIRM THAT YOU HAVE CLOSED OUT YOUR FILE.

VERY TRULY YOURS,

Conrad Dussel

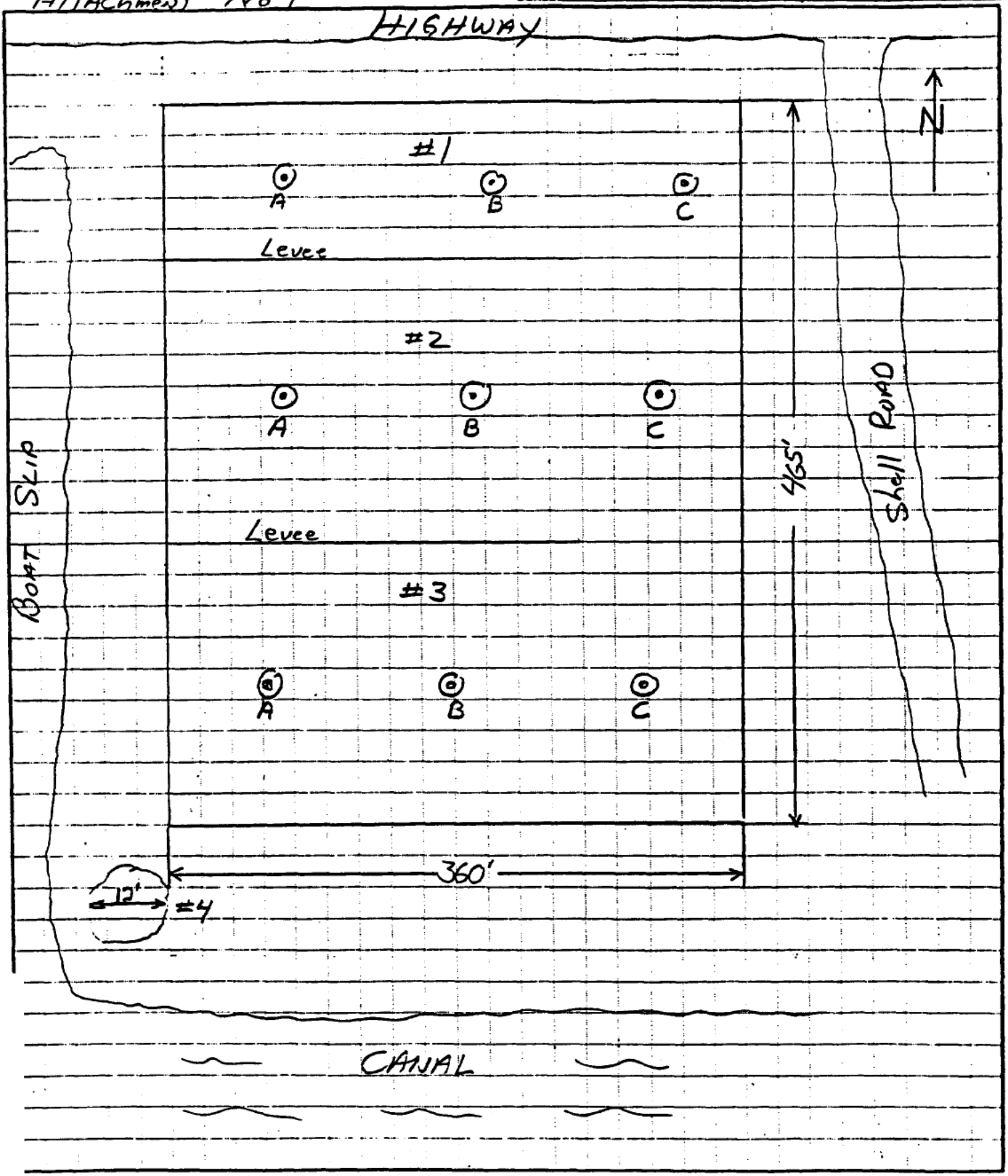
CONRAD A. DUSSEL, P.E.
PROJECT ENGINEER

CAD:MLV
ATTACHMENTS
CC: DUDLEY DEVILLE (DEQ)
TOM PATTERSON (DEQ)
HOWARD SEIFE (MILBANK, ET.AL.)

WINK ENGINEERING
A Division of Wink, Inc.
7520 Hayne Blvd.
New Orleans, Louisiana 70126-1899
(504) 246-7924

JOB Delta Shipyard - Houma, LA
SHEET NO. 1 OF 1
CALCULATED BY CAO DATE 6/18/85
CHECKED BY DATE
SCALE 3 Covered Pits / 1 Open Spill

ATTACHMENT No 1



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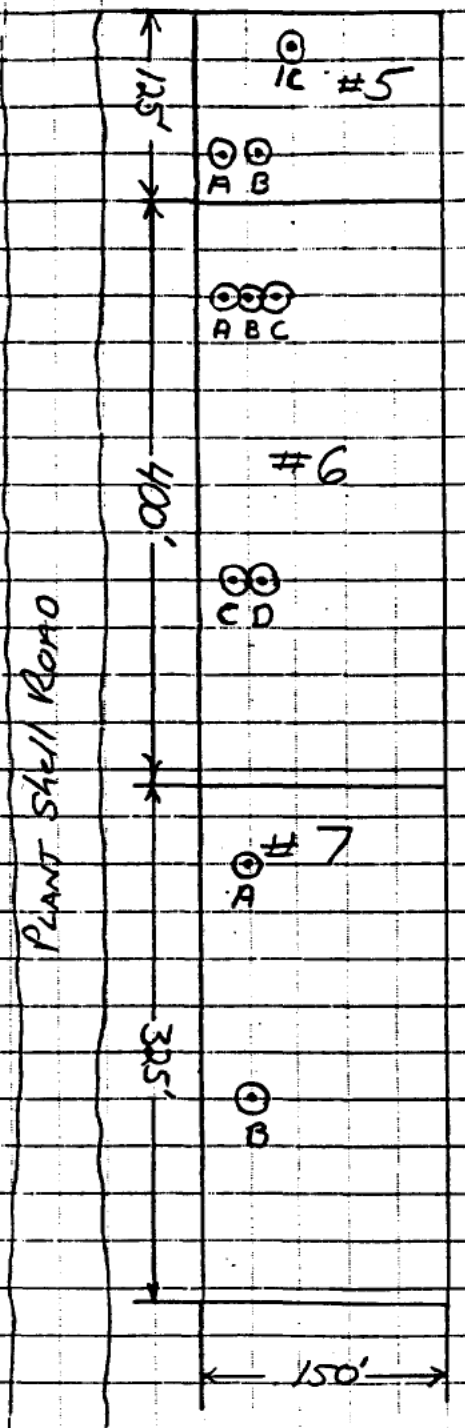
New Orleans, Louisiana 70126-1899
(504) 246-7924

JOB DELTA SHIPYARD - HOUMA, LA
SHEET NO. 1 OF 1
CALCULATED BY CLAN DATE 6/18/85
CHECKED BY DATE
SCALE 3 EXPOSED SURF. IMPOUNDMENTS

ATTACHMENT No. 2



DELTA SHIPYARD

CHROMALLOY

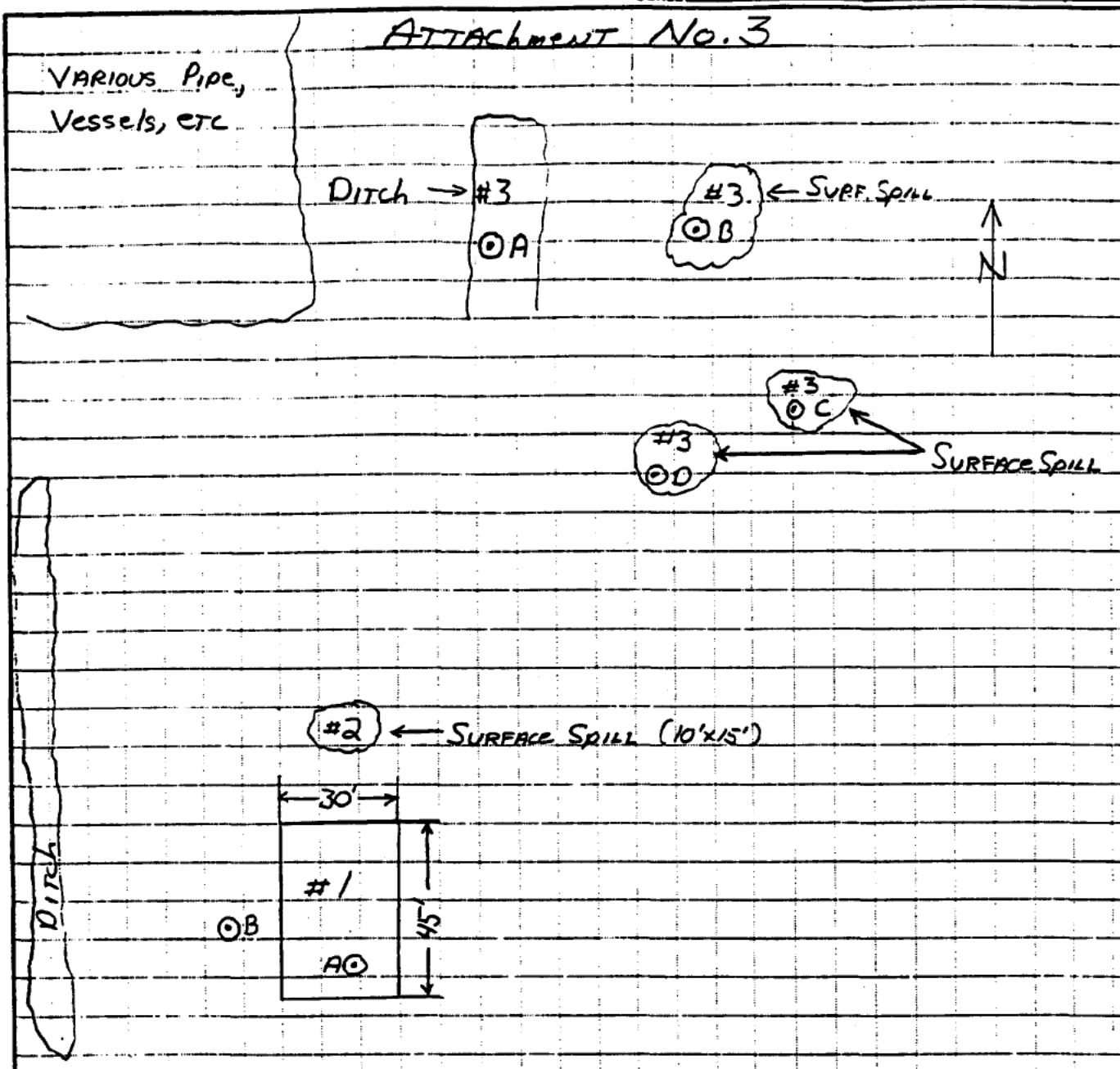
PLANT SHELL ROAD

CANAL

WINK ENGINEERING
A Division of Wink, Inc.
7520 Hayne Blvd.
New Orleans, Louisiana 70126-1899
(504) 246-7924

JOB DELTA SHIPYARD - DUSON, LA
SHEET NO. 1 OF 1
CALCULATED BY CAO DATE 6/18/85
CHECKED BY DATE
SCALE 1 SUBMERGED TANK + MISC. SPILLS

ATTACHMENT No. 3



DUSON

ATTACHMENT NO. 4
DELTA SHIPYARD SLUDGE SAMPLING PROTOCOL
HOUMA, LA
MAY 20, JUNE 5 & JUNE 6, 1985

SAMPLE NO.	DEPTH
1A	1'-6"
1A	2'-6"
1A	4'-6"
1A	5'-6"
1B	1'-0"
1B	3'-0"
1B	5'-6"
1C	SURFACE
1C	2'-0"
1C	3'-0"
1C	4'-6"
1C	5'-6"
2A	1'-0"
2A	3'-6"
2A	5'-6"
2B	0'-6"
2B	2'-6"
2B	4'-0"
2C	1'-0"
2C	3'-0"
2C	5'-6"
3A	0'-6"
3A	1'-6"
3A	3'-6"
3A	4'-6"
3B	1'-0"
3B	3'-0"
3C	0'-6"
3C	2'-0"
3C	4'-0"
4	SURFACE SAMPLES

SAMPLE NO.	DEPTH
5A	2'-0"
5A	3'-0"
5A	4'-0"
5A	5'-6"
5B	0'-6"
5B	1'-6"
5B	3'-6"
5B	5'-0"
5C	SURFACE
5C	1'-0"
5C	2'-0"
5C	5'-6"
6A	0'-6"
6A	2'-0"
6A	4'-0"
6B	1'-0"
6B	2'-6"
6B	3'-6"
6B 16	5'-6"
6C	1'-0"
6C	2'-0"
6C	3'-0"
6C	4'-0"
6C	5'-0"
6D	SURFACE
6D	1'-6"
6D	2'-6"
6D	3'-0"
7A	SURFACE
7A	2'-0"
7A 6	3'-0"
7B	0'-6"
7B	2'-6"
7B	4'-0"

ATTACHMENT NO. 5
DELTA SHIPYARD SLUDGE SAMPLING PROTOCOL
DUSON, LA
JUNE 5, 1985

SAMPLE NO.	DEPTH
1A	SURFACE (LIQUID)
1B	0'-6" (WITHIN 8" OF PIT
1B	1'-0"
1B	3'-6"
1B	5'-0"
2	0'-6"
2	1'-0"
2	3'-0"
3A	SURFACE
3B	SURFACE
3C	SURFACE
3D	SURFACE

WEST·PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

SAMPLE ANALYSES

for

WINK ENGINEERING
7520 Hayne Blvd.
New Orleans, Louisiana 70126-1899

ATTENTION: Mr. Conrad A. Dussel

June 11, 1985

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Samples collected by Wink Engineering as documented by the enclosed chain-of-custody form, were received at West-Paine Laboratories, Incorporated on June 5, 1985 and June 7, 1985. The samples were analyzed according to the Environmental Protection Agency protocol:

A. Test Methods for Evaluating Solid Waste, SW-846, July 1982:

Parameter	Method
Cyanide	9010
Ignitability	1010
EP Toxicity Extraction Procedure	1310
Arsenic	7060
Barium	7080
Cadmium	7130
Chromium	7190
Lead	7420
Mercury	7470
Selenium	7740
Silver	7760
Volatile Organic Fraction	8240
pH	9040

B. Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980:

Parameter	Method
Oil & Grease	503C

nal

84-2092

WEST-PAINE Laboratories INC.
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WINK ENGINEERING
New Orleans, Louisiana

June 11, 1985

C. Standard Methods for the Examination of Water and Wastewater, 14th Edition, 1979:

Parameter	Method
Phenol	510A, 510B

The results are on the following pages.

Victor J. Blanchard, III
Manager

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: DUSON #1 Composite

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	0.53	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	8.5	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	36,100	10.0/8.4	06-10/1600/RH

DUSON

WEST-PAINE Laboratories INC.
7979 OSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: DUSON #2 Composite

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	0.43	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	9.2	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	53,000	10.0/8.4	06-10/1600/RH

DUSON

nal

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: DUSON #3 Composite

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	0.15	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	9.0	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	163,000	10.0/8.4	06-10/1600/RH

DUSON

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: [redacted]

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	<0.15	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	7.7	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	4,650	10.0/8.4	06-10/1600/RH

Houma

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85-2082

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: HOUMA #2 Composite

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	<0.15	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	8.2	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	2,980	10.0/8.4	06-10/1600/RH

nal

85-2082

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana

June 11, 1985

Sample Identification: HOUMA #3 Composite

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	<0.15	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	7.4	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	150	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	3,100	10.0/8.4	06-10/1600/RH

nal

WEST-PAINE Laboratories INC.
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WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: [redacted] Composite

Date Received: June 5, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	0.69	0.020/0.021	06-07/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	7.8	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	311,000	10.0/8.4	06-11/0900/RH

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: HOUMA #5 Composite

Date Received: June 7, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	3.0	0.020/0.020	06-10/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	9.1	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	104,000	10.0/8.4	06-11/0900/RH

nal

85-2082

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

Sample Identification: HOUMA #6 Composite

Date Received: June 7, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	2.5	0.020/0.020	06-10/0800/BE
Cyanide (mg/kg CN)	<0.5	0.100/0.110	06-07/0930/MS
pH (Units) as 4% w/v	9.3	7.0/7.0	06-10/1200/RC
Flashpoint (^{o}F)	>200	Not Applicable	Not Applicable
Oil & Grease (mg/kg)	183,000	10.0/8.4	06-11/0900/RH

CORRECTED REPORT

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE LA 70820

WINK ENGINEERING
New Orleans, Louisiana
May 29, 1985

Sample Identification: #7 HOUMA COMPOSITE

Date Received: May 21, 1985

Parameter	Results	Quality Assurance Actual/Found	Date/Time Analyst
Phenol (mg/kg Phenol)	2.3	0.020/0.020	05-24/1630/BE
Cyanide (mg/kg CN)	<0.2	0.10/0.11	05-26/1100/RC
pH (Units) as 4% w/v	9.0	7.0/7.0	05-24/1300/RC
Flashpoint (^{o}F)	>200	------	Not Applicable
Oil & Grease (mg/kg)	331,000	10.0/9.2	05-23/2000/FT

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85-1925

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: DUSON #1, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	<0.01	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	0.3	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.008	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.01	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	<0.04	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 104.44 gm

DUSON

nal

85-2092

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: DUSON #2, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	<0.01	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	0.2	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.016	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.01	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	<0.04	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 103.64 gm

nal

85-2092

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: DUSON #3, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	<0.01	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	0.3	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.016	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.01	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	0.12	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 103.77 gm

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: HOUMA #1, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	<0.01	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	<0.1	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.012	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.01	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	<0.04	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 100.84 gm

WEST-PAINE Laboratories INC.
7979 OSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana

June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: HOUMA #2, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	0.02	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	0.2	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.016	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.01	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	<0.04	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 103.07 gm

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana

June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: HOUMA #3, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	0.1	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	<0.01	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	<0.005	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.01	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	<0.04	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 102.30 gm

WEST-PAINE Laboratories INC.
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WINK ENGINEERING
New Orleans, Louisiana

June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: HOUMA #4, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	<0.01	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	0.1	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.008	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	<0.1	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	0.91	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 103.50 gm

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: HOUMA #5, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	0.04	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	2.6	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.016	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	0.48	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	1.5	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 107.50 gm

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70820

WINK ENGINEERING
New Orleans, Louisiana
June 11, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: HOUMA #6, Composite

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	0.07	5.0	0.050/0.049	06-10/RM
Barium (mg/L Ba)	1.7	100	2.50/2.54	06-10/RM
Cadmium (mg/L Cd)	0.016	1.0	0.250/0.248	06-10/RM
Chromium (mg/L Cr)	0.56	5.0	0.50/0.51	06-10/RM
Lead (mg/L Pb)	1.2	5.0	2.50/2.46	06-10/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0109	06-10/RM
Selenium (mg/L Se)	<0.01	1.0	0.050/0.051	06-09/RM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	06-10/RM

Sample Weight: 102.80 gm

nal

CORRECTED REPORT

WEST·PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE LA 70820

WINK ENGINEERING
New Orleans, Louisiana
May 29, 1985

The total weight of solid material filtered from the sample as received is listed below. The Extraction Procedure (EP Toxicity Test) was employed as specified in the Federal Register, Monday, May 19, 1980, Appendix II, pages 33127 - 33128. The results below for sample extract, in mg/L, represent the concentration in the final leachate. For purpose of comparison, the maximum allowable concentration of each component is listed.

Sample Identification: #7 HOUMA COMPOSITE

Parameter	Results	Maximum Allowable in Extract	Quality Assurance Actual/Found	Date/ Analyst
Arsenic (mg/L As)	0.09	5.0	0.50/0.48	05-23/VM
Barium (mg/L Ba)	0.7	100	2.50/2.36	05-24/RM
Cadmium (mg/L Cd)	<0.005	1.0	0.250/0.250	05-23/VM
Chromium (mg/L Cr)	0.02	5.0	0.50/0.50	05-24/RM
Lead (mg/L Pb)	0.12	5.0	2.50/2.50	05-24/RM
Mercury (mg/L Hg)	<0.0002	0.2	0.0100/0.0105	05-23/VM
Selenium (mg/L Se)	0.03	1.0	0.050/0.048	05-23/VM
Silver (mg/L Ag)	<0.01	5.0	0.50/0.50	05-23/VM

Sample Weight: 102.06

WEST-PAINE Laboratories INC.
7979 GSRI AVE. • BATON ROUGE, LA 70808

Wink Engineering
New Orleans, Louisiana
060585-51-53

PRIORITY POLLUTANTS
VOLATILES FRACTIONS

All results in milligrams per kilog

	Duson #1	Duson #2	Duson #3
Benzene	<0.02	<0.02	<0.02
Bromoform	<0.02	<0.02	<0.02
Carbon tetrachloride	<0.02	<0.02	<0.02
Chlorobenzene	<0.02	0.27	<0.02
Chlorodibromomethane	<0.02	<0.02	<0.02
Chloroethane	<0.02	<0.02	<0.02
2-Chloroethylvinyl ether	<0.02	<0.02	<0.02
Chloroform	<0.02	<0.02	<0.02
1,2-Dichlorobenzene	<0.02	<0.02	<0.02
1,4-Dichlorobenzene	<0.02	<0.02	<0.02
1,3-Dichlorobenzene	<0.02	<0.02	<0.02
Dichlorobromomethane	<0.02	<0.02	<0.02
1,1-Dichloroethane	<0.02	<0.02	<0.02
1,2-Dichloroethane	<0.02	<0.02	<0.02
1,1-Dichloroethene	<0.02	<0.02	<0.02
trans-1,2-Dichloroethene	<0.02	<0.02	<0.02
1,2-Dichloropropane	<0.02	<0.02	<0.02
cis-1,3-Dichloropropene	<0.02	<0.02	<0.02
trans-1,3-Dichloropropene	<0.02	<0.02	<0.02
Ethylbenzene	0.06	0.65	<0.02
Methylbromide	<0.02	<0.02	<0.02
Methylchloride	<0.02	<0.02	<0.02
Methylene chloride	<0.02	<0.02	<0.02
1,1,2,2-Tetrachloroethane	<0.02	<0.02	<0.02
Tetrachloroethene	<0.02	<0.02	<0.02
Toluene	0.07	0.70	<0.02
1,1,1-Trichloroethane	<0.02	<0.02	<0.02
1,1,2-Trichloroethane	<0.02	<0.02	<0.02
Trichloroethene	<0.02	<0.02	<0.02
Trichlorofluormethane	<0.02	<0.02	<0.02
Vinyl chloride	<0.02	<0.02	<0.02
Total Xylene (semiquantitative)	0.46	6.7	<0.02
Date of Analyses	06-07-85	06-07-85	06-07-85

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE, LA 70808

Wink Engineering

New Orleans, Louisiana

060585-54-57

PRIORITY POLLUTANTS
VOLATILES FRACTIONS

All results in milligrams per kilogra

	[redacted]	Houma #2	Houma #3	Houma #4
Benzene	<0.02	<0.02	<0.02	<0.02
Bromoform	<0.02	<0.02	<0.02	<0.02
Carbon tetrachloride	<0.02	<0.02	<0.02	<0.02
Chlorobenzene	<0.02	<0.02	<0.02	<0.02
Chlorodibromomethane	<0.02	<0.02	<0.02	<0.02
Chloroethane	<0.02	<0.02	<0.02	<0.02
2-Chloroethylvinyl ether	<0.02	<0.02	<0.02	<0.02
Chloroform	<0.02	<0.02	<0.02	<0.02
1,2-Dichlorobenzene	<0.02	<0.02	<0.02	<0.02
1,4-Dichlorobenzene	<0.02	<0.02	<0.02	<0.02
1,3-Dichlorobenzene	<0.02	<0.02	<0.02	<0.02
Dichlorobromomethane	<0.02	<0.02	<0.02	<0.02
1,1-Dichloroethane	<0.02	<0.02	<0.02	<0.02
1,2-Dichloroethane	<0.02	<0.02	<0.02	<0.02
1,1-Dichloroethene	<0.02	<0.02	<0.02	<0.02
trans-1,2-Dichloroethene	<0.02	<0.02	<0.02	<0.02
1,2-Dichloropropane	<0.02	<0.02	<0.02	<0.02
cis-1,3-Dichloropropene	<0.02	<0.02	<0.02	<0.02
trans-1,3-Dichloropropene	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	<0.02	<0.02	<0.02	<0.02
Methylbromide	<0.02	<0.02	<0.02	<0.02
Methylchloride	<0.02	<0.02	<0.02	<0.02
Methylene chloride	<0.02	<0.02	<0.02	<0.02
1,1,2,2-Tetrachloroethane	<0.02	<0.02	<0.02	<0.02
Tetrachloroethene	<0.02	<0.02	<0.02	<0.02
Toluene	0.02	<0.02	<0.02	<0.02
1,1,1-Trichloroethane	<0.02	<0.02	<0.02	<0.02
1,1,2-Trichloroethane	<0.02	<0.02	<0.02	<0.02
Trichloroethene	<0.02	<0.02	<0.02	<0.02
Trichlorofluormethane	<0.02	<0.02	<0.02	<0.02
Vinyl chloride	<0.02	<0.02	<0.02	<0.02
Total Xylene (semiquantitative)	<0.02	<0.02	<0.02	<0.02
Date of Analyses	06-07-85	06-07-85	06-07-85	06-07-85

WEST-PAINE Laboratories INC.
7979 USHI AVE • BATON ROUGE, LA 70808

Wink Engineering
New Orleans, Louisiana
060785-45-46

PRIORITY POLLUTANTS
VOLATILES FRACTIONS

All results in milligrams per kilogr
ppm

	Houma #5	Houma #6
Benzene	<0.04	<0.04
Bromoform	<0.04	<0.04
Carbon tetrachloride	<0.04	<0.04
Chlorobenzene	0.20	0.05
Chlorodibromomethane	<0.04	<0.04
Chloroethane	<0.04	<0.04
2-Chloroethylvinyl ether	<0.04	<0.04
Chloroform	<0.04	<0.04
1,2-Dichlorobenzene	<0.04	<0.04
1,4-Dichlorobenzene	<0.04	<0.04
1,3-Dichlorobenzene	<0.04	<0.04
Dichlorobromomethane	<0.04	<0.04
1,1-Dichloroethane	<0.04	<0.04
1,2-Dichloroethane	<0.04	<0.04
1,1-Dichloroethene	<0.04	<0.04
trans-1,2-Dichloroethene	<0.04	<0.04
1,2-Dichloropropane	<0.04	<0.04
cis-1,3-Dichloropropene	<0.04	<0.04
trans-1,3-Dichloropropene	<0.04	<0.04
thylbenzene	0.99	0.57
Methylbromide	<0.04	<0.04
Methylchloride	<0.04	<0.04
Methylene chloride	<0.04	<0.04
1,1,2,2-Tetrachloroethane	<0.04	<0.04
Tetrachloroethene	<0.04	<0.04
Toluene	1.45	0.49
1,1,1-Trichloroethane	<0.04	<0.04
1,1,2-Trichloroethane	<0.04	<0.04
Trichloroethene	<0.04	<0.04
Trichlorofluormethane	<0.04	<0.04
Vinyl chloride	<0.04	<0.04
Total Xylene (semiquantitative)	10.6	0.2
Date of Analyses	06-07-85	06-07-85

WEST-PAINE Laboratories INC.
7979 GSRI AVE • BATON ROUGE, LA 70820

Wink Engineering

New Orleans, Louisiana

052185-45-46

All results in milligrams per kilogram

PRIORITY POLLUTANTS
VOLATILES FRACTIONS

	Houma #7 Composite
Benzene	<0.02
Bromoform	<0.02
Carbon tetrachloride	<0.02
Chlorobenzene	<0.02
Chlorodibromomethane	<0.02
Chloroethane	<0.02
2-Chloroethylvinyl ether	<0.02
Chloroform	<0.02
1,2-Dichlorobenzene	<0.02
1,4-Dichlorobenzene	<0.02
1,3-Dichlorobenzene	<0.02
Dichlorobromomethane	<0.02
1,1-Dichloroethane	<0.02
1,2-Dichloroethane	<0.02
1,1-Dichloroethene	<0.02
trans-1,2-Dichloroethene	<0.02
1,2-Dichloropropane	<0.02
cis-1,3-Dichloropropene	<0.02
trans-1,3-Dichloropropene	<0.02
Ethylbenzene	<0.02
Methylbromide	<0.02
Methylchloride	<0.02
Methylene chloride	<0.02
1,1,2,2-Tetrachloroethane	<0.02
Tetrachloroethene	<0.02
Toluene	<0.02
1,1,1-Trichloroethane	<0.02
1,1,2-Trichloroethane	<0.02
Trichloroethene	<0.02
Trichlorofluormethane	<0.02
Vinyl chloride	<0.02
Total Xylene (semiquantitative)	<0.02
Date of Analyses	05-27-85

REFERENCE 7-NOT USED

REFERENCE 8-NOT USED

REFERENCE 9-NOT USED

REFERENCE 10-NOT USED

REFERENCE 11-NOT USED

REFERENCE 12

GROUND WATER
IN
LOUISIANA

WATER RESOURCES BULLETIN No. 1

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and
LOUISIANA DEPARTMENT OF PUBLIC WORKS
Baton Rouge, La.
August 1960

the alluvium on the fringes of the valley. The sharp decrease in the depth of fresh water occurrence (pl. 3) marks the southern limit of flushing by fresh water in Pliocene deposits.

Yields of wells in the deposits of Pliocene age generally are less than those from the overlying Quaternary deposits. The largest known yield from Pliocene deposits in area 1 is about 1,000 gpm from a well at Oakdale, in Allen Parish. Only a few wells have been completed in strata of Pliocene age in area 1 mainly because of the availability of large quantities of water from the overlying Quaternary deposits. The primary reason for the development of this aquifer is to obtain water of a better quality than that from the overlying Quaternary deposits. Two analyses of water from the Pliocene in area 1 are included in table 7. These analyses indicate that the water is of the soft sodium bicarbonate type, but, both samples were greatly discolored, probably due to organic matter, and had a somewhat high total iron content. In addition, water from well Ev-142 contains fluoride in a concentration high enough to cause severe mottling of the teeth of children.

In area 2 many wells are completed in Pliocene deposits to take advantage of the good quality of water and high artesian head. Flowing wells are common throughout this area except in the Baton Rouge area where large withdrawals of water for municipal and industrial supplies have lowered the piezometric surface. The largest yield from the Pliocene sediments in area 2 is a natural flow of about 3,200 gpm from a municipal-supply well at Slidell.

Analyses of water from four wells in area 2 are listed in table 7. These analyses indicate that the water typically is the soft, sodium bicarbonate type. Other chemical constituents vary in concentration areally and with depth. Shallower wells generally yield acid-tending waters with lower dissolved-solids content and greater quantities of iron than water from the deeper wells. Three of the samples of water from area 2 were slightly discolored. This color would not be readily apparent, but one well (SL-166)

yields water which has a color higher than the limit of 20 set by the U.S. Public Health Service.

QUATERNARY SYSTEM

The Quaternary deposits of Louisiana are composed of sediments of Pleistocene and Recent age. The Pleistocene deposits are of two general types; an approximately coastwise, gulfward-thickening wedge of deltaic sediments and the relatively thin, veneerlike deposits which form the stream terraces and alluvial valley fills. The deposits of Recent age form a thin mantle of sand, silt, and clay restricted to stream valleys and coastal areas. The Recent deposits generally are thin and not important as aquifers; therefore, they are not differentiated from the deposits of Pleistocene age on plate 2. The deposits of Pleistocene age that have been divided into formations by Fisk (1938, 1940, and 1944) and Jones (1954) comprise several hydrologic units which do not coincide with the formations.

It is difficult to differentiate between the coastwise Quaternary deposits and the underlying Pliocene deposits in those areas where the basal Quaternary deposits are not gravelly. The lack of distinctive lithologic units at the contact of Pliocene and Quaternary deposits is illustrated by the composite electrical log of the Miocene, Pliocene, and Quaternary deposits (fig. 13). Thus, correlations must be considered approximate because of the lithologic similarity of the two deposits. The Quaternary deposits throughout the State are composed of gravel, sand, silt, and clay and range in thickness from less than 50 feet in central and northern Louisiana to more than 3,500 feet near the coast. They are shown as one unit on the fence diagram (pl. 2).

The Quaternary deposits, which blanket most of Louisiana (pl. 1 and fig. 16), yield about two-thirds of all the ground water pumped in the State. To describe the availability of fresh water the Quaternary deposits have been divided into upland and valley deposits. The relatively thin Quaternary valley deposits fill the major stream valleys and blanket the coastal areas. The Quaternary upland deposits also consist of two major groups—the rela-

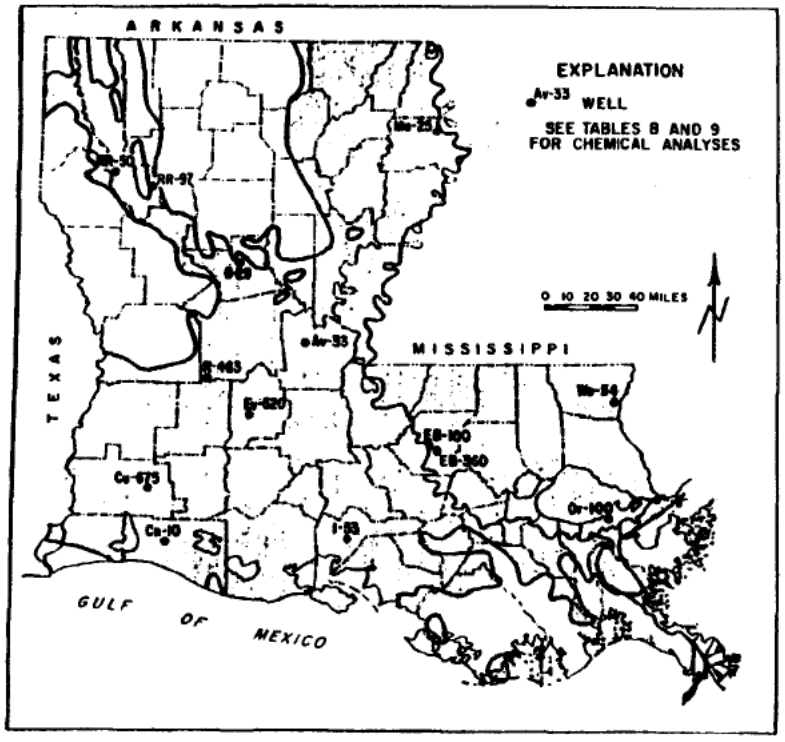


Figure 16. Map showing the approximate area where rocks of the Quaternary system contain fresh water.

tively thin terraced deposits which flank the stream valleys of northern Louisiana and the coastwise terraced deposits which dip and thicken toward the coast. (See pl. 2.)

Quaternary Valley Deposits

The Quaternary valley deposits are recharged mainly from rainfall. The streams that flow across these deposits normally are effluent during most of the year, and groundwater discharge contributes significantly to the base flow of these streams. The hydraulic gradient near the streams is reversed during high-water stages, and the streams become influent for brief periods. However, on a yearly basis the discharge into streams exceeds the recharge from them. The valley deposits are recharged to a small extent from upward movement of water from underlying aquifers of Tertiary age and from lateral movement from adjacent

Quaternary upland deposits. Movement of ground water in the valley deposits is generally toward the major streams and downstream, because of the gradient imposed by topography.

The occurrence of fresh ground water is irregular in the lower Mississippi River valley. (See fig. 16—east of well I-53 and south of well Or-100.) The occurrence of fresh ground water in this area may be related to the positions of ancestral channels of the Mississippi River.

Valley deposits throughout much of the State are composed of sand and gravel near the base and become progressively finer grained toward the top. The basal sand and gravel is a prolific source of water and wells in the deposits yield as much as 4,000 gpm.

Analyses of water from five wells completed in Quaternary valley deposits are given in table 8. These analyses show that the water generally is very hard and has a high total iron content. The hardness ranges from 228 ppm to 480 ppm. All the analyses listed in table 8 show a total iron content in excess of the U.S. Public Health Service's recommended limit of 0.3 ppm. However, the potentially high yields of wells in these deposits and the relatively low water temperature make these deposits an excellent source of water for irrigation and some industrial purposes.

Quaternary Upland Deposits

Terraced Deposits of Northern Louisiana

The terraced deposits which flank the stream valleys and cap the older formations in northern Louisiana are recharged by local rainfall. Ground water in these deposits generally is under water-table conditions and moves from topographically high positions to local stream valleys.

The terraced deposits generally are composed of a sedimentary sequence which ranges in grain size from coarse at the base to fine at the top, much like the deposits in the valley areas. The lower part of the section in many areas contains gravel, but the yields of wells completed in these deposits, generally are small because of the relatively thin saturated thickness of the deposits.

The analyses of water from two wells (G-29 and RR-97) completed in these deposits are given in table 9, and the locations of the wells are shown on figure 16. Water from these deposits has a very low dissolved-solids content and is soft. Excessive total iron concentrations (greater than 0.3 ppm) would require some treatment to make the water completely suitable for domestic use.

COASTWISE TERRACES AND THEIR SUBSURFACE EQUIVALENTS

The terraced deposits of northern Louisiana coalesce with their coastwise equivalent in the southern third of the State. The coastwise deposits gradually dip and thicken gulfward. These sediments have been named the Chicot reservoir in southwestern Louisiana (Jones, 1954, p. 138). The equivalent but finer textured sequence in southeastern Louisiana is unnamed.

The deposits are recharged mainly by rainfall in the outcrop areas throughout southern Louisiana. In southwestern Louisiana, because of heavy withdrawals there are several additional sources of recharge. These sources of recharge are from water moving through the confining beds (Jones, 1954, p. 170-172) and perennially or periodically from streams that incise the aquifers. Such recharge is undesirable where the water in the streams is salty, such as in the lower Vermilion River (Jones, 1954, p. 164-170). The hydraulic gradient in southwestern Louisiana in the recent past has been toward the Gulf of Mexico; however, heavy withdrawals for irrigation and industry have reversed the gradient along the coast and caused saline waters to move slowly northward. This movement is discussed by Jones (1954, p. 223-225), Fader (1957, p. 21), and Harder (1957, p. 158-160).

The coastal terrace deposits in southeastern Louisiana are a part of a larger hydraulic system. The distribution of head with depth in aquifers in the northern part of the area indicates that water from precipitation enters the terraced deposits, either in the outcrop area or through beds that are only partly confining, and migrates downward through the deposits and into the underlying aquifers. The land surface is underlain by clay in the southern part of

the area; however, some water from precipitation may migrate through this confining bed into the coastal terraced deposits. Deeper aquifers, which contain water under greater hydrostatic head, probably are additional sources of recharge.

Yields of wells completed in these deposits generally are large. The largest yield is about 6,000 gpm from a well for rice irrigation in southwestern Louisiana, where the average yield of irrigation wells is about 1,800 gpm. The potential yield of wells is less in the outcrop area because of the thinning of the aquifer.

The dissolved-solids content of the water is low in the outcrop areas of the coastal terraced deposits, as typified by the analysis of water from well R-463 (table 9). Mineralization of ground water increases downdip, as indicated by a comparison of the analyses of water from wells R-463 and Wa-54 with those of water from wells in the central and southern parts of the coastal area. (See table 9 and fig. 16.) The deposits in a large part of southwestern Louisiana and the northern part of southeastern Louisiana generally contain water having an objectionable quantity of iron. Wells R-463 and Wa-54, near the outcrop area, yield water having a relatively low pH and a high iron content. The water generally is soft in southeastern Louisiana; however, the water in southwestern Louisiana may increase in hardness as it moves downdip.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
1,1,1-Trichloroethane	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
1,1,2,2-Tetrachloroethane	ND	-----	13 UJ	68 U	21 UJ	21 UJ	18 UJ	18 UJ
1,1,2-Trichloroethane	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
1,1-Dichloroethane	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
1,1-Dichloroethene	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
1,2-Dichloroethane	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
1,2-Dichloroethene (total)	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
1,2-Dichloropropane	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
2-Butanone	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
2-Hexanone	ND	-----	13 UJ	68 U	21 UJ	21 UJ	18 UJ	18 UJ
4-Methyl-2-pentanone	ND	-----	13 UJ	68 U	21 UJ	21 UJ	18 UJ	18 UJ
Acetone	ND	-----	13 UJ	160 UJ	21 U	21 U	18 U	18 UJ
Benzene	ND	-----	13 UJ	73	21 UJ	21 U	18 UJ	18 UJ
Bromodichloromethane	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Bromoform	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Bromomethane	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
Carbon disulfide	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
Carbon tetrachloride	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Chlorobenzene	ND	-----	13 UJ	68 U	21 UJ	21 UJ	18 UJ	18 UJ
Chloroethane	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
Chloroform	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
Chloromethane	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
cis-1,3-Dichloropropene	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Dibromochloromethane	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Ethylbenzene	ND	-----	13 UJ	170	21 UJ	21 UJ	18 UJ	18 UJ
Methylene Chloride	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
Styrene	ND	-----	13 UJ	68 U	21 UJ	21 UJ	18 UJ	18 UJ
Tetrachloroethene	ND	-----	13 UJ	68 U	21 UJ	21 UJ	18 UJ	18 UJ

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
Toluene	5	15	13 UJ	43 J C-BSQL	21 UJ	5 Jv	18 UJ	18 UJ
trans-1,3-Dichloropropene	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Trichloroethene	ND	-----	13 UJ	68 U	21 UJ	21 U	18 UJ	18 UJ
Vinyl Chloride	ND	-----	13 UJ	68 U	21 U	21 U	18 U	18 UJ
Xylenes (total)	ND	-----	13 UJ	240	21 UJ	21 UJ	18 UJ	18 UJ

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
1,2,4-Trichlorobenzene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
1,2-Dichlorobenzene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
1,3-Dichlorobenzene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
1,4-Dichlorobenzene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2,2'-Oxybis(1-chloropropane)	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2,4,5-Trichlorophenol	ND	-----	1000 U	11000 U	1700 U	1700 U	1400 U	1400 U
2,4,6-Trichlorophenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2,4-Dichlorophenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2,4-Dimethylphenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2,4-Dinitrophenol	ND	-----	1000 U	11000 U	1700 U	1700 U	1400 U	1400 U
2-Chloronaphthalene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2-Chlorophenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2-Methylnaphthalene	69	207	430 U	47000	700 U	690 U	580 U	580 U
2-Methylphenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
2-Nitroaniline	ND	-----	1000 U	11000 U	1700 U	1700 U	1400 U	1400 U
2-Nitrophenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
3,3'-Dichlorobenzidine	ND	-----	430 UJ	4500 U	700 U	690 U	580 U	580 U
3-Nitroaniline	ND	-----	1000 U	11000 U	1700 U	1700 U	1400 U	1400 U
4,6-Dinitro-2-methylphenol	ND	-----	1000 UR	11000 U	1700 U	1700 U	1400 U	1400 U
4-Bromophenyl-phenylether	ND	-----	430 UR	4500 U	700 U	690 U	580 U	580 U
4-Chloro-3-methylphenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
4-Chloroaniline	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
4-Chlorophenyl-phenylether	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
4-Methylphenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
4-Nitroaniline	ND	-----	1000 U	11000 U	1700 U	1700 U	1400 U	1400 U
4-Nitrophenol	ND	-----	1000 UR	11000 U	1700 U	1700 U	1400 U	1400 U
Acenaphthene	ND	-----	430 U	1800 J C-BSQL	700 U	470 J C-BSQL	580 U	34 J C-BSQL
Acenaphthylene	ND	-----	430 U	550 J C-BSQL	700 U	89 J C-BSQL	60 J C-BSQL	46 J C-BSQL

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
Anthracene	ND	-----	430 UR	540 J C-BSQL	700 U	1300 J	83 J C-BSQL	82 J C-BSQL
Benzo(a)anthracene	ND	-----	430 UJ	440 J C-BSQL	700 U	6000 J	580 J	310 J C-BSQL
Benzo(a)pyrene	ND	-----	430 UJ	210 J C-BSQL	700 U	4100 J	390 J C-BSQL	190 J C-BSQL
Benzo(b)fluoranthene	ND	-----	300 Jv	450 J C-BSQL	700 U	6100 J	840 J	410 J C-BSQL
Benzo(g,h,i)perylene	ND	-----	430 UJ	4500 U	700 U	2500 J	430 J C-BSQL	290 J C-BSQL
Benzo(k)fluoranthene	ND	-----	430 UJ	4500 U	700 U	690 U	580 U	580 U
bis(2-Chloroethoxy)methane	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
bis(2-Chloroethyl)ether	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
bis(2-Ethylhexyl)phthalate	ND	-----	430 UJ	4500 U	700 U	190 J C-BSQL	120 J C-BSQL	580 U
Butylbenzylphthalate	ND	-----	430 UJ	4500 U	700 U	690 U	580 U	580 U
Carbazole	ND	-----	430 UR	4500 U	700 U	690	580 U	87 J C-BSQL
Chrysene	ND	-----	1200 Jv	460 J C-BSQL	700 U	5300 J	710 J	270 J C-BSQL
Di-n-butylphthalate	ND	-----	430 UR	4500 U	700 U	690 U	580 U	580 U
Di-n-octylphthalate	ND	-----	430 UJ	4500 U	700 U	690 U	580 U	580 U
Dibenz(a,h)anthracene	ND	-----	430 UJ	4500 U	700 U	1300 J	180 J C-BSQL	580 U
Dibenzofuran	ND	-----	430 U	1300 J C-BSQL	700 U	120 J C-BSQL	580 U	580 U
Diethylphthalate	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Dimethylphthalate	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Fluoranthene	ND	-----	430 UR	4500 U	700 U	13000 J	1000 J	530 J C-BSQL
Fluorene	ND	-----	430 U	5100	700 U	310 J C-BSQL	580 U	40 J C-BSQL
Hexachlorobenzene	ND	-----	430 UR	4500 U	700 U	690 U	580 U	580 U
Hexachlorobutadiene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Hexachlorocyclopentadiene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Hexachloroethane	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Indeno(1,2,3-cd)pyrene	ND	-----	430 UJ	4500 U	700 U	3000 J	390 J C-BSQL	210 J C-BSQL
Isophorone	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
N-Nitroso-di-n-propylamine	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
N-Nitrosodiphenylamine	ND	-----	430 UR	4500 U	700 U	690 U	580 U	580 U

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
Naphthalene	ND	-----	430 U	11000	700 U	690 U	580 U	580 U
Nitrobenzene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Pentachlorophenol	ND	-----	1000 UR	11000 U	1700 U	1700 U	1400 U	1400 U
Phenanthrene	ND	-----	430 UR	8800	700 U	5000 J	310 J C-BSQL	440 J C-BSQL
Phenol	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U
Pyrene	ND	-----	430 UJ	740 J C-BSQL	700 U	12000 J	570 J C-BSQL	390 J C-BSQL

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Pesticides Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
4,4'-DDD	ND	-----	35	4.5 U	7 U	6.9 U	5.8 U	5.8 U
4,4'-DDE	ND	-----	4.3 U	4.5 U	7 UJ	6.9 U	5.8 U	5.8 U
4,4'-DDT	ND	-----	4.3 UR	4.5 U	7 U	6.9 U	5.8 U	5.8 U
Aldrin	ND	-----	2.2 U	2.3 U	3.6 UJ	3.5 U	3 U	3 U
alpha-BHC	ND	-----	2.2 U	2.3 U	3.6 UJ	3.5 U	3 U	3 U
alpha-Chlordane	ND	-----	2.2 U	4.5 U	3.6 UJ	3.5 U	3 U	0.32 J C-BSQL
beta-BHC	7.4	22.2	12 JT	2.3 U	1.1 Jv	3.5 U	3 U	3 U
delta-BHC	ND	-----	2.2 U	2.3 U	3.6 UJ	3.5 U	0.26 J C-BSQL	3 U
Dieldrin	ND	-----	4.3 U	4.5 U	7 UJ	6.9 U	5.8 U	5.8 U
Endosulfan I	ND	-----	2.2 U	2.3 U	3.6 U	3.5 U	3 U	3 U
Endosulfan II	ND	-----	4.3 U	4.5 U	7 U	6.9 U	5.8 U	5.8 U
Endosulfan sulfate	ND	-----	4.3 U	4.5 U	7 U	6.9 U	5.8 U	5.8 U
Endrin	ND	-----	4.3 U	4.5 U	7 UJ	6.9 U	5.8 U	5.8 U
Endrin aldehyde	ND	-----	4.3 U	13 JT C-NA	7 U	6.9 U	5.8 U	5.8 U
Endrin ketone	ND	-----	7.1 JT C-NA	1 J C-BSQL	7 U	6.9 U	5.8 U	5.8 U
gamma-BHC (lindane)	ND	-----	2.2 U	2.3 U	3.6 UJ	3.5 U	3 U	3 U
gamma-Chlordane	1.1	3.3	2.2 U	9.8 JT C-NA	3.6 UJ	0.39 J	0.26 J	0.26 J
Heptachlor	ND	-----	2.2 U	1.5 J C-BSQL	0.17 Jv C-BSQL	3.5 U	3 U	3 U
Heptachlor epoxide	1.3	3.9	25 J C-NA	3.7 J	2.3 Jv	3.5 U	3 U	3 U
Methoxychlor	ND	-----	69 J	23 U	3.7 J C-BSQL	35 U	30 U	30 U
Toxaphene	ND	-----	220 UJ	230 U	360 U	350 U	300 U	300 U

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Polychorinated Biphenyls Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
Aroclor-1016	ND	-----	43 U	45 U	70 U	69 U	58 U	58 U
Aroclor-1221	ND	-----	88 U	92 UJ	140 U	140 U	120 U	120 U
Aroclor-1232	ND	-----	43 UJ	45 U	70 U	69 U	58 U	58 U
Aroclor-1242	ND	-----	43 UJ	45 U	70 U	69 U	58 U	58 U
Aroclor-1248	ND	-----	43 UJ	45 U	70 U	69 U	58 U	58 U
Aroclor-1254	ND	-----	43 UJ	45 U	70 U	69 U	58 U	58 U
Aroclor-1260	ND	-----	43 UJ	45 U	70 U	69 U	58 U	58 U

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Metals Results (mg/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 MFDP04 08/22/94	SED002 SED002 MFDP05 08/22/94	SED003 SED003 MFDP06 08/22/94	SED005 SED005 MFDP08 08/22/94	SED005 SED006 MFDP09 08/22/94	SED007 SED007 MFDP10 08/22/94
ALUMINUM	3400	10200	6430	6830	6160	9090	6890	10900
ANTIMONY	ND	-----	10.5 J	7.5 J	9.7 UJ	10.9 UJ	12.5 J	12 UJ
ARSENIC	4.9	14.7	22.1 Jv	6.3 Jv	4.2 Jv	24.8 Jv	16.3 Jv	23.1 Jv
BARIUM	5540	16620	11900	15100	18000	20100	17300	20500
BERYLLIUM	0.29	0.87	0.53	0.49	0.39	0.79	0.75	0.94
CADMIUM	ND	-----	4.9	1 U	1.8	1.5 U	1.7	1.6 U
CALCIUM	86100	258300	12000	4030	4810	9420	14200	16400
CHROMIUM	58.3	174.9	527	54.4	35.2	27.8	39.1	42.8
COBALT	5	15	9.7	11.4	8.8 Jv	13.5	10.5 Jv	16.8 C-NA
COPPER	66.8	200.4	75.2 J	48.4 J	33.6 J	61.3 J	55.2 J	45.8 J
CYANIDE	ND	-----	0.67 U	0.65 U	0.85 U	0.95 U	0.88 U	1.1 U
IRON	23200	69600	21500	43200	10200	19800	16400	21400
LEAD	92	276	632	185	158	181	195	125
MAGNESIUM	5300	15900	2850	2100	2470	3740	3270	4610
MANGANESE	245	735	480	231	120	280	305	509
MERCURY	ND	-----	1.3 J	0.22 J	0.23 J	0.29 J	0.3 J	0.21 UJ
NICKEL	9.4	28.2	18.9	25.2	12.9	24.4	19.4	28.4 C-NA
POTASSIUM	703	2109	1570	1270	1140	1760	1420	1610
SELENIUM	ND	-----	0.37	0.18 U	0.31	0.27 U	0.25 U	0.29 U
SILVER	1.4	4.2	4.1	3.3	1.3	2.2	3.5	3.3
SODIUM	241	723	331	180	181	289	253	360
THALLIUM	0.5	1.5	0.61	0.4	0.41	0.76	0.47	0.62
VANADIUM	9	27	24.4	18.7	14.9	25.4	19.5	30.1
ZINC	805	2415	835	302	149	449	444	245

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Characterization Sampling Explosives Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED001 SED001 FDB32 08/22/94	SED002 SED002 FDB33 08/22/94	SED003 SED003 FDB35 08/22/94	SED005 SED005 FDB38 08/22/94	SED005 SED006 FDB39 08/22/94	SED007 SED007 FDB41 08/22/94
2,4-Dinitrotoluene	ND	-----	430 UR	4500 U	700 U	690 U	580 U	580 U
2,6-Dinitrotoluene	ND	-----	430 U	4500 U	700 U	690 U	580 U	580 U

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
1,1,1-Trichloroethane	ND	-----	15 UJ					
1,1,2,2-Tetrachloroethane	ND	-----	15 UJ					
1,1,2-Trichloroethane	ND	-----	15 UJ					
1,1-Dichloroethane	ND	-----	15 UJ					
1,1-Dichloroethene	ND	-----	15 UJ					
1,2-Dichloroethane	ND	-----	15 UJ					
1,2-Dichloroethene (total)	ND	-----	15 UJ					
1,2-Dichloropropane	ND	-----	15 UJ					
2-Butanone	ND	-----	15 UJ					
2-Hexanone	ND	-----	15 UJ					
4-Methyl-2-pentanone	ND	-----	15 UJ					
Acetone	ND	-----	15 UJ					
Benzene	ND	-----	15 UJ					
Bromodichloromethane	ND	-----	15 UJ					
Bromoform	ND	-----	15 UJ					
Bromomethane	ND	-----	15 UJ					
Carbon disulfide	ND	-----	15 UJ					
Carbon tetrachloride	ND	-----	15 UJ					
Chlorobenzene	ND	-----	15 UJ					
Chloroethane	ND	-----	15 UJ					
Chloroform	ND	-----	15 UJ					
Chloromethane	ND	-----	15 UJ					
cis-1,3-Dichloropropene	ND	-----	15 UJ					
Dibromochloromethane	ND	-----	15 UJ					
Ethylbenzene	ND	-----	15 UJ					
Methylene Chloride	ND	-----	15 UJ					
Styrene	ND	-----	15 UJ					
Tetrachloroethene	ND	-----	15 UJ					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Toluene	5	15	5 Jv					
trans-1,3-Dichloropropene	ND	-----	15 UJ					
Trichloroethene	ND	-----	15 UJ					
Vinyl Chloride	ND	-----	15 UJ					
Xylenes (total)	ND	-----	15 UJ					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Pesticides Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
4,4'-DDD	ND	-----	5.1 U					
4,4'-DDE	ND	-----	5.1 U					
4,4'-DDT	ND	-----	5.1 U					
Aldrin	ND	-----	2.6 U					
alpha-BHC	ND	-----	2.6 U					
alpha-Chlordane	ND	-----	2.6 U					
beta-BHC	7.4	22.2	7.4 T					
delta-BHC	ND	-----	2.6 U					
Dieldrin	ND	-----	5.1 U					
Endosulfan I	ND	-----	2.6 U					
Endosulfan II	ND	-----	5.1 U					
Endosulfan sulfate	ND	-----	5.1 U					
Endrin	ND	-----	5.1 U					
Endrin aldehyde	ND	-----	5.1 U					
Endrin ketone	ND	-----	5.1 U					
gamma-BHC (lindane)	ND	-----	2.6 U					
gamma-Chlordane	1.1	3.3	1.1 J					
Heptachlor	ND	-----	2.6 U					
Heptachlor epoxide	1.3	3.9	1.3 J					
Methoxychlor	ND	-----	26 U					
Toxaphene	ND	-----	260 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Polychorinated Biphenyls Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Aroclor-1016	ND	-----	51 U					
Aroclor-1221	ND	-----	100 U					
Aroclor-1232	ND	-----	51 U					
Aroclor-1242	ND	-----	51 U					
Aroclor-1248	ND	-----	51 U					
Aroclor-1254	ND	-----	51 U					
Aroclor-1260	ND	-----	51 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
1,2,4-Trichlorobenzene	ND	-----	510 U					
1,2-Dichlorobenzene	ND	-----	510 U					
1,3-Dichlorobenzene	ND	-----	510 U					
1,4-Dichlorobenzene	ND	-----	510 U					
2,2'-Oxybis(1-chloropropane)	ND	-----	510 U					
2,4,5-Trichlorophenol	ND	-----	1200 U					
2,4,6-Trichlorophenol	ND	-----	510 U					
2,4-Dichlorophenol	ND	-----	510 U					
2,4-Dimethylphenol	ND	-----	510 U					
2,4-Dinitrophenol	ND	-----	1200 U					
2-Chloronaphthalene	ND	-----	510 U					
2-Chlorophenol	ND	-----	510 U					
2-Methylnaphthalene	69	207	69 J					
2-Methylphenol	ND	-----	510 U					
2-Nitroaniline	ND	-----	1200 U					
2-Nitrophenol	ND	-----	510 U					
3,3'-Dichlorobenzidine	ND	-----	510 UJ					
3-Nitroaniline	ND	-----	1200 U					
4,6-Dinitro-2-methylphenol	ND	-----	1200 U					
4-Bromophenyl-phenylether	ND	-----	510 U					
4-Chloro-3-methylphenol	ND	-----	510 U					
4-Chloroaniline	ND	-----	510 U					
4-Chlorophenyl-phenylether	ND	-----	510 U					
4-Methylphenol	ND	-----	510 U					
4-Nitroaniline	ND	-----	1200 U					
4-Nitrophenol	ND	-----	1200 U					
Acenaphthene	ND	-----	510 U					
Acenaphthylene	ND	-----	510 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)

Delta Shipyard (CERCLIS ID LAD058475419)

Sediment Background Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Anthracene	ND	-----	510 U					
Benzo(a)anthracene	ND	-----	510 UJ					
Benzo(a)pyrene	ND	-----	510 UJ					
Benzo(b)fluoranthene	ND	-----	510 UJ					
Benzo(g,h,i)perylene	ND	-----	510 UJ					
Benzo(k)fluoranthene	ND	-----	510 UJ					
bis(2-Chloroethoxy)methane	ND	-----	510 U					
bis(2-Chloroethyl)ether	ND	-----	510 U					
bis(2-Ethylhexyl)phthalate	ND	-----	510 UJ					
Butylbenzylphthalate	ND	-----	510 UJ					
Carbazole	ND	-----	510 U					
Chrysene	ND	-----	510 UJ					
Di-n-butylphthalate	ND	-----	510 U					
Di-n-octylphthalate	ND	-----	510 UJ					
Dibenz(a,h)anthracene	ND	-----	510 UJ					
Dibenzofuran	ND	-----	510 U					
Diethylphthalate	ND	-----	510 U					
Dimethylphthalate	ND	-----	510 U					
Fluoranthene	ND	-----	510 U					
Fluorene	ND	-----	510 U					
Hexachlorobenzene	ND	-----	510 U					
Hexachlorobutadiene	ND	-----	510 U					
Hexachlorocyclopentadiene	ND	-----	510 U					
Hexachloroethane	ND	-----	510 U					
Indeno(1,2,3-cd)pyrene	ND	-----	510 UJ					
Isophorone	ND	-----	510 U					
N-Nitroso-di-n-propylamine	ND	-----	510 U					
N-Nitrosodiphenylamine	ND	-----	510 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)

Delta Shipyard (CERCLIS ID LAD058475419)

Sediment Background Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Naphthalene	ND	-----	510 U					
Nitrobenzene	ND	-----	510 U					
Pentachlorophenol	ND	-----	1200 U					
Phenanthrene	ND	-----	510 U					
Phenol	ND	-----	510 U					
Pyrene	ND	-----	510 UJ					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Metals Results (mg/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 MFDP07 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
ALUMINUM	3400	10200	3400					
ANTIMONY	ND	-----	7.6 UJ					
ARSENIC	4.9	14.7	4.9 Jv					
BARIUM	5540	16620	5540					
BERYLLIUM	0.29	0.87	0.29					
CADMIUM	ND	-----	1 U					
CALCIUM	86100	258300	86100					
CHROMIUM	58.3	174.9	58.3					
COBALT	5	15	5 Jv					
COPPER	66.8	200.4	66.8 J					
CYANIDE	ND	-----	0.67 U					
IRON	23200	69600	23200					
LEAD	92	276	92					
MAGNESIUM	5300	15900	5300					
MANGANESE	245	735	245					
MERCURY	ND	-----	0.13 UJ					
NICKEL	9.4	28.2	9.4					
POTASSIUM	703	2109	703					
SELENIUM	ND	-----	0.19 UJ					
SILVER	1.4	4.2	1.4					
SODIUM	241	723	241					
THALLIUM	0.5	1.5	0.5 J					
VANADIUM	9	27	9					
ZINC	805	2415	805					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Sediment Background Sampling Explosives Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SED004 SED004 FDB36 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
2,4-Dinitrotoluene	ND	-----	510 U					
2,6-Dinitrotoluene	ND	-----	510 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/23/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
1,1,1-Trichloroethane	ND	-----	13 UJ	14 U				
1,1,2,2-Tetrachloroethane	ND	-----	13 UJ	14 U				
1,1,2-Trichloroethane	ND	-----	13 UJ	14 U				
1,1-Dichloroethane	ND	-----	13 UJ	14 U				
1,1-Dichloroethene	ND	-----	13 UJ	14 U				
1,2-Dichloroethane	ND	-----	13 UJ	14 U				
1,2-Dichloroethene (total)	ND	-----	13 UJ	14 U				
1,2-Dichloropropane	ND	-----	13 UJ	14 U				
2-Butanone	ND	-----	13 UJ	14 U				
2-Hexanone	ND	-----	13 UJ	14 U				
4-Methyl-2-pentanone	ND	-----	13 UJ	14 U				
Acetone	ND	-----	13 UJ	40 U				
Benzene	ND	-----	13 UJ	14 U				
Bromodichloromethane	ND	-----	13 UJ	14 U				
Bromoform	ND	-----	13 UJ	14 U				
Bromomethane	ND	-----	13 UJ	14 U				
Carbon disulfide	ND	-----	13 UJ	14 U				
Carbon tetrachloride	ND	-----	13 UJ	14 U				
Chlorobenzene	ND	-----	13 UJ	14 U				
Chloroethane	ND	-----	13 UJ	14 U				
Chloroform	ND	-----	13 UJ	14 U				
Chloromethane	ND	-----	13 UJ	14 U				
cis-1,3-Dichloropropene	ND	-----	13 UJ	14 U				
Dibromochloromethane	ND	-----	13 UJ	14 U				
Ethylbenzene	ND	-----	13 UJ	14 U				
Methylene Chloride	ND	-----	13 UJ	14 U				
Styrene	ND	-----	13 UJ	14 U				
Tetrachloroethene	ND	-----	13 UJ	14 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)

Delta Shipyard (CERCLIS ID LAD058475419)

Soil Characterization Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Toluene	ND	-----	13 UJ	14 U				
trans-1,3-Dichloropropene	ND	-----	13 UJ	14 U				
Trichloroethene	ND	-----	13 UJ	14 U				
Vinyl Chloride	ND	-----	13 UJ	14 U				
Xylenes (total)	ND	-----	13 UJ	14 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/23/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
1,2,4-Trichlorobenzene	ND	-----	440 U	470 U				
1,2-Dichlorobenzene	ND	-----	440 U	470 U				
1,3-Dichlorobenzene	ND	-----	440 U	470 U				
1,4-Dichlorobenzene	ND	-----	440 U	470 U				
2,2'-Oxybis(1-chloropropane)	ND	-----	440 U	470 U				
2,4,5-Trichlorophenol	ND	-----	1100 U	1100 U				
2,4,6-Trichlorophenol	ND	-----	440 U	470 U				
2,4-Dichlorophenol	ND	-----	440 U	470 U				
2,4-Dimethylphenol	ND	-----	440 U	470 U				
2,4-Dinitrophenol	ND	-----	1100 U	1100 U				
2-Chloronaphthalene	ND	-----	440 U	470 U				
2-Chlorophenol	ND	-----	440 U	470 U				
2-Methylnaphthalene	ND	-----	440 U	250 J C-BSQL				
2-Methylphenol	ND	-----	440 U	470 U				
2-Nitroaniline	ND	-----	1100 U	1100 U				
2-Nitrophenol	ND	-----	440 U	470 U				
3,3'-Dichlorobenzidine	ND	-----	440 U	470 U				
3-Nitroaniline	ND	-----	1100 U	1100 U				
4,6-Dinitro-2-methylphenol	ND	-----	1100 U	1100 U				
4-Bromophenyl-phenylether	ND	-----	440 U	470 U				
4-Chloro-3-methylphenol	ND	-----	440 U	470 U				
4-Chloroaniline	ND	-----	440 U	470 U				
4-Chlorophenyl-phenylether	ND	-----	440 U	470 U				
4-Methylphenol	ND	-----	440 U	470 U				
4-Nitroaniline	ND	-----	1100 U	1100 U				
4-Nitrophenol	ND	-----	1100 U	1100 U				
Acenaphthene	ND	-----	440 U	470 U				
Acenaphthylene	ND	-----	440 U	470 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Anthracene	ND	-----	51 J C-BSQL	470 U				
Benzo(a)anthracene	33	99	100 J C-BSQL	95 J				
Benzo(a)pyrene	ND	-----	86 J C-BSQL	470 U				
Benzo(b)fluoranthene	53	159	130 J	85 J				
Benzo(g,h,i)perylene	ND	-----	100 J C-BSQL	470 U				
Benzo(k)fluoranthene	ND	-----	440 U	470 U				
bis(2-Chloroethoxy)methane	ND	-----	440 U	470 U				
bis(2-Chloroethyl)ether	ND	-----	440 U	470 U				
bis(2-Ethylhexyl)phthalate	130	390	71 J	470 U				
Butylbenzylphthalate	ND	-----	440 U	470 U				
Carbazole	ND	-----	440 U	470 U				
Chrysene	83	249	120 J	200 J				
Di-n-butylphthalate	ND	-----	440 U	470 U				
Di-n-octylphthalate	ND	-----	440 U	470 U				
Dibenz(a,h)anthracene	ND	-----	440 U	470 U				
Dibenzofuran	ND	-----	440 U	470 U				
Diethylphthalate	ND	-----	440 U	470 U				
Dimethylphthalate	ND	-----	440 U	470 U				
Fluoranthene	68	204	210 J C-BSQL	430 J C-BSQL				
Fluorene	ND	-----	440 U	470 U				
Hexachlorobenzene	ND	-----	440 U	470 U				
Hexachlorobutadiene	ND	-----	440 U	470 U				
Hexachlorocyclopentadiene	ND	-----	440 U	470 U				
Hexachloroethane	ND	-----	440 U	470 U				
Indeno(1,2,3-cd)pyrene	ND	-----	84 J C-BSQL	470 U				
Isophorone	ND	-----	440 U	470 U				
N-Nitroso-di-n-propylamine	ND	-----	440 U	470 U				
N-Nitrosodiphenylamine	ND	-----	440 U	470 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)

Delta Shipyard (CERCLIS ID LAD058475419)

Soil Characterization Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Naphthalene	ND	-----	440 U	470 U				
Nitrobenzene	ND	-----	440 U	470 U				
Pentachlorophenol	ND	-----	1100 U	1100 U				
Phenanthrene	32	96	120 J C-BSQL	480 C-BSQL				
Phenol	ND	-----	440 U	470 U				
Pyrene	52	156	130 J	260 J C-BSQL				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Pesticides Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/23/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
4,4'-DDD	ND	-----	4.4 U	4.7 U				
4,4'-DDE	ND	-----	4.4 U	4.7 U				
4,4'-DDT	ND	-----	4.4 U	4.7 U				
Aldrin	ND	-----	2.3 U	2.4 U				
alpha-BHC	ND	-----	2.3 U	2.4 U				
alpha-Chlordane	0.35	1.05	0.54 J	2.4 U				
beta-BHC	ND	-----	1.1 J C-BSQL	0.64 J C-BSQL				
delta-BHC	ND	-----	2.3 U	2.4 U				
Dieldrin	ND	-----	4.4 U	4.7 U				
Endosulfan I	ND	-----	2.3 U	2.4 U				
Endosulfan II	ND	-----	4.4 U	4.7 U				
Endosulfan sulfate	ND	-----	4.4 U	4.7 U				
Endrin	ND	-----	4.4 U	4.7 U				
Endrin aldehyde	ND	-----	4.4 U	4.7 U				
Endrin ketone	ND	-----	4.4 U	4.7 U				
gamma-BHC (lindane)	ND	-----	2.3 U	2.4 U				
gamma-Chlordane	0.34	1.02	1.1 J C-BSQL	2.4 U				
Heptachlor	ND	-----	2.3 U	2.4 U				
Heptachlor epoxide	ND	-----	0.26 J C-BSQL	2.4 U				
Methoxychlor	ND	-----	23 U	24 U				
Toxaphene	ND	-----	230 U	240 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Polychorinated Biphenyls Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Aroclor-1016	ND	-----	44 U	47 U				
Aroclor-1221	ND	-----	89 U	96 U				
Aroclor-1232	ND	-----	44 U	47 U				
Aroclor-1242	ND	-----	44 U	47 U				
Aroclor-1248	ND	-----	44 U	47 U				
Aroclor-1254	ND	-----	44 U	47 U				
Aroclor-1260	ND	-----	44 U	47 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Metals Results (mg/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 MFDP02 08/22/94	SS003 SS003 MFDP03 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
ALUMINUM	9330	27990	8660	11500				
ANTIMONY	8.1	24.3	7.5 UJ	7.8 UJ				
ARSENIC	7.7	23.1	29.7 Jv	20.7 Jv				
BARIUM	4920	14760	18900	14700				
BERYLLIUM	0.7	2.1	0.59	0.86				
CADMIUM	ND	-----	2.6	1.8				
CALCIUM	17300	51900	11100	9230				
CHROMIUM	18.5	55.5	87.1	90.2				
COBALT	9.1	27.3	12.3	12				
COPPER	32.8	98.4	63.8 J	46.9 J				
CYANIDE	ND	-----	0.66 U	0.69 U				
IRON	16400	49200	18800	22000				
LEAD	117	351	345	174				
MAGNESIUM	4200	12600	3460	4430				
MANGANESE	467	1401	530	410				
MERCURY	ND	-----	0.77 J	0.39 J				
NICKEL	27.2	81.6	16.5	19.1				
POTASSIUM	1890	5670	1580	2180				
SELENIUM	0.34	1.02	0.53	0.5				
SILVER	1.9	5.7	2.9	1.8				
SODIUM	164	492	219	490				
THALLIUM	0.53	1.59	0.6 J	0.51				
VANADIUM	23.7	71.1	24.3	29.1				
ZINC	206	618	666	367				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Characterization Sampling Explosives Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS002 SS002 FDB29 08/22/94	SS003 SS003 FDB30 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
2,4-Dinitrotoluene	ND	-----	440 U	470 U				
2,6-Dinitrotoluene	ND	-----	440 U	470 U				

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
1,1,1-Trichloroethane	ND	-----	15 U					
1,1,2,2-Tetrachloroethane	ND	-----	15 U					
1,1,2-Trichloroethane	ND	-----	15 U					
1,1-Dichloroethane	ND	-----	15 U					
1,1-Dichloroethene	ND	-----	15 U					
1,2-Dichloroethane	ND	-----	15 U					
1,2-Dichloroethene (total)	ND	-----	15 U					
1,2-Dichloropropane	ND	-----	15 U					
2-Butanone	ND	-----	15 U					
2-Hexanone	ND	-----	15 U					
4-Methyl-2-pentanone	ND	-----	15 U					
Acetone	ND	-----	15 U					
Benzene	ND	-----	15 U					
Bromodichloromethane	ND	-----	15 U					
Bromoform	ND	-----	15 U					
Bromomethane	ND	-----	15 U					
Carbon disulfide	ND	-----	15 U					
Carbon tetrachloride	ND	-----	15 U					
Chlorobenzene	ND	-----	15 U					
Chloroethane	ND	-----	15 U					
Chloroform	ND	-----	15 U					
Chloromethane	ND	-----	15 U					
cis-1,3-Dichloropropene	ND	-----	15 U					
Dibromochloromethane	ND	-----	15 U					
Ethylbenzene	ND	-----	15 U					
Methylene Chloride	ND	-----	15 U					
Styrene	ND	-----	15 U					
Tetrachloroethene	ND	-----	15 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)

Delta Shipyard (CERCLIS ID LAD058475419)

Soil Background Sampling Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Toluene	ND	-----	15 U					
trans-1,3-Dichloropropene	ND	-----	15 U					
Trichloroethene	ND	-----	15 U					
Vinyl Chloride	ND	-----	15 U					
Xylenes (total)	ND	-----	15 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Pesticides Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
4,4'-DDD	ND	-----	4.9 U					
4,4'-DDE	ND	-----	4.9 U					
4,4'-DDT	ND	-----	4.9 U					
Aldrin	ND	-----	2.5 U					
alpha-BHC	ND	-----	2.5 U					
alpha-Chlordane	0.35	1.05	0.35 J					
beta-BHC	ND	-----	2.5 U					
delta-BHC	ND	-----	2.5 U					
Dieldrin	ND	-----	4.9 U					
Endosulfan I	ND	-----	2.5 U					
Endosulfan II	ND	-----	4.9 U					
Endosulfan sulfate	ND	-----	4.9 U					
Endrin	ND	-----	4.9 U					
Endrin aldehyde	ND	-----	4.9 U					
Endrin ketone	ND	-----	4.9 U					
gamma-BHC (lindane)	ND	-----	2.5 U					
gamma-Chlordane	0.34	1.02	0.34 J					
Heptachlor	ND	-----	O.14 J					
Heptachlor epoxide	ND	-----	2.5 U					
Methoxychlor	ND	-----	25 U					
Toxaphene	ND	-----	250 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Polychorinated Biphenyls Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Aroclor-1016	ND	-----	49 U					
Aroclor-1221	ND	-----	100 U					
Aroclor-1232	ND	-----	49 U					
Aroclor-1242	ND	-----	49 U					
Aroclor-1248	ND	-----	49 U					
Aroclor-1254	ND	-----	49 U					
Aroclor-1260	ND	-----	49 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
1,2,4-Trichlorobenzene	ND	-----	490 U					
1,2-Dichlorobenzene	ND	-----	490 U					
1,3-Dichlorobenzene	ND	-----	490 U					
1,4-Dichlorobenzene	ND	-----	490 U					
2,2'-Oxybis(1-chloropropane)	ND	-----	490 U					
2,4,5-Trichlorophenol	ND	-----	1200 U					
2,4,6-Trichlorophenol	ND	-----	490 U					
2,4-Dichlorophenol	ND	-----	490 U					
2,4-Dimethylphenol	ND	-----	490 U					
2,4-Dinitrophenol	ND	-----	1200 U					
2-Chloronaphthalene	ND	-----	490 U					
2-Chlorophenol	ND	-----	490 U					
2-Methylnaphthalene	ND	-----	490 U					
2-Methylphenol	ND	-----	490 U					
2-Nitroaniline	ND	-----	1200 U					
2-Nitrophenol	ND	-----	490 U					
3,3'-Dichlorobenzidine	ND	-----	490 U					
3-Nitroaniline	ND	-----	1200 U					
4,6-Dinitro-2-methylphenol	ND	-----	1200 U					
4-Bromophenyl-phenylether	ND	-----	490 U					
4-Chloro-3-methylphenol	ND	-----	490 U					
4-Chloroaniline	ND	-----	490 U					
4-Chlorophenyl-phenylether	ND	-----	490 U					
4-Methylphenol	ND	-----	490 U					
4-Nitroaniline	ND	-----	1200 U					
4-Nitrophenol	ND	-----	1200 U					
Acenaphthene	ND	-----	490 U					
Acenaphthylene	ND	-----	490 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)
Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Anthracene	ND	-----	490 U					
Benzo(a)anthracene	33	99	33 J					
Benzo(a)pyrene	ND	-----	490 U					
Benzo(b)fluoranthene	53	159	53 J					
Benzo(g,h,i)perylene	ND	-----	490 U					
Benzo(k)fluoranthene	ND	-----	490 U					
bis(2-Chloroethoxy)methane	ND	-----	490 U					
bis(2-Chloroethyl)ether	ND	-----	490 U					
bis(2-Ethylhexyl)phthalate	130	390	130 J					
Butylbenzylphthalate	ND	-----	490 U					
Carbazole	ND	-----	490 U					
Chrysene	83	249	83 J					
Di-n-butylphthalate	ND	-----	490 U					
Di-n-octylphthalate	ND	-----	490 U					
Dibenz(a,h)anthracene	ND	-----	490 U					
Dibenzofuran	ND	-----	490 U					
Diethylphthalate	ND	-----	490 U					
Dimethylphthalate	ND	-----	490 U					
Fluoranthene	68	204	68 J					
Fluorene	ND	-----	490 U					
Hexachlorobenzene	ND	-----	490 U					
Hexachlorobutadiene	ND	-----	490 U					
Hexachlorocyclopentadiene	ND	-----	490 U					
Hexachloroethane	ND	-----	490 U					
Indeno(1,2,3-cd)pyrene	ND	-----	490 U					
Isophorone	ND	-----	490 U					
N-Nitroso-di-n-propylamine	ND	-----	490 U					
N-Nitrosodiphenylamine	ND	-----	490 U					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

(Continued)

Delta Shipyard (CERCLIS ID LAD058475419)

Soil Background Sampling Semi-Volatile Organics Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
Naphthalene	ND	-----	490 U					
Nitrobenzene	ND	-----	490 U					
Pentachlorophenol	ND	-----	1200 U					
Phenanthrene	32	96	32 J					
Phenol	ND	-----	490 U					
Pyrene	52	156	52 J					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Metals Results (mg/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 MFDP01 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
ALUMINUM	9330	27990	9330					
ANTIMONY	8.1	24.3	8.1 J					
ARSENIC	7.7	23.1	7.7 Jv					
BARIUM	4920	14760	4920					
BERYLLIUM	0.7	2.1	0.7					
CADMIUM	ND	-----	1.1 U					
CALCIUM	17300	51900	17300					
CHROMIUM	18.5	55.5	18.5					
COBALT	9.1	27.3	9.1 Jv					
COPPER	32.8	98.4	32.8 J					
CYANIDE	ND	-----	0.71 U					
IRON	16400	49200	16400					
LEAD	117	351	117					
MAGNESIUM	4200	12600	4200					
MANGANESE	467	1401	467					
MERCURY	ND	-----	0.14 UJ					
NICKEL	27.2	81.6	27.2					
POTASSIUM	1890	5670	1890					
SELENIUM	0.34	1.02	0.34					
SILVER	1.9	5.7	1.9					
SODIUM	164	492	164					
THALLIUM	0.53	1.59	0.53					
VANADIUM	23.7	71.1	23.7					
ZINC	206	618	206					

Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

Delta Shipyard (CERCLIS ID LAD058475419)
Soil Background Sampling Explosives Results (ug/kg)

Analyte	Maximum Background	3 Times Maximum Background	SS001 SS001 FDB27 08/22/94	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose	Left Blank On Purpose
2,4-Dinitrotoluene	ND	-----	490 U					
2,6-Dinitrotoluene	ND	-----	490 U					

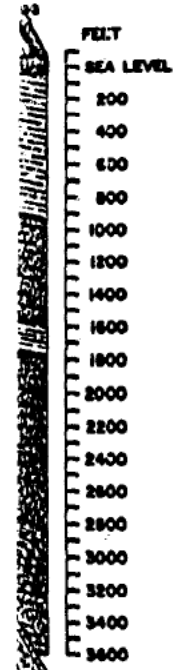
Shaded Values Exceed 3 Times Maximum Background Value for Constituents Attributable to the Site.

REFERENCE 13

FENCE DIAGRAM
SHOWING
SUBSURFACE GEOLOGY
OF
LOUISIANA

EXPLANATION

Recent Pleistocene		Q	QUATERNARY
Pliocene		Tp	
Miocene		Tm	
Oligocene	Vicksburg	Tv	TERTIARY
	Jackson		
Eocene	Claiborne	Cockfield	
		Tcm	
		Cook Mountain	
		Sparta	
		Tcr	
		Cane River	
Eocene-Paleocene	Wilcox	Tw	
Paleocene	Midway	Tmy	
Undifferentiated		K	CRETACEOUS



Maximum depth to which fresh ground water occurs, intermediate sands may contain salt water

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REFERENCE 14

99564

FEATURES

to reddish brown massive silt with some clay and minor amounts of
Stippled map units are those overlain by 1 to 9 meters of loess.

Surface exposure of limestone, gypsum, and anhydrite; only at
n Parish) and Pine Prairie (Evangeline Parish) salt domes. Areas are
ap at this scale

ed where approximately located, dotted where concealed

ncludes inferred contacts. Dashed where approximately located.

Alluvium — Gray to brownish gray clay and silty clay, reddish brown in the Red River Valley; some sand and gravel locally. Includes all alluvial valley deposits except natural levees of major streams.

Natural Levees — Gray and brown silt, silty clay, some very fine sand, reddish brown along the Red River. Shown only on past and present courses of major streams.

Odf

Delta Plain, Fresh Marsh — Gray to black clay of very high organic content, some peat. Area of active and abandoned delta lobes of the Mississippi River.

Delta Plain, Saline Marsh — Gray to black clay of high organic content, some peat. Area of active and abandoned delta lobes of the Mississippi River.

Ocf

Chenier Plain, Fresh Marsh — Gray to brown to black clay and silt of high organic content. Area of accretion by longshore currents from major delta complex.

Chenier Plain, Saline Marsh — Gray to brown to black clay and silt of moderate organic content. Area of accretion by longshore currents from major delta complex.

Cheniers — White to light gray fine sand and shell fragments comprising low, elongate relict beach ridges.

Deweyville Terrace — Gray mixed with brown-to-red clay and silty clay, some sand and gravel locally. Topographically higher than Holocene alluvium and lower than Prairie terraces. Found along streams of intermediate size.

Braided Stream Terraces — Light gray, tan, and brown fine to coarse sand, some clay, silt, and gravel. Glacial outwash of ancestral Arkansas River.

Qtp

Prairie Terraces — Light gray to light brown clay, sandy clay, silt, sand, and some gravel. Surfaces generally show little dissection and are topographically higher than the Deweyville. Three levels are recognized: two along alluvial valleys, the lower coalescing with the broad coastwise expression; the third, still lower, found intermittently gulfward.

Intermediate Terraces — Light gray to orange-brown clay, sandy clay, and silt; much sand and gravel locally. Surfaces show more dissection and are topographically higher than the Prairie. Composed of terraces formerly designated as Montgomery, Irene, and most of the Bentley.

High Terraces — Tan to orange clay, silt, and sand with a large amount of basal gravel. Surfaces are highly dissected and less continuous than lower terraces. Composed of terraces formerly designated as Williana, Citronelle, and the highest Bentley.

Mlb

Blounts Creek Member — Gray to green silty clays, siltstones, and silts with abundant sand beds; some lignite and lenses of black chert gravel.

Mlcc

Castor Creek Member — Gray to dark gray calcareous clays which may weather to black soil, lignitic clays and noncalcareous clayey silts.

Mlw

Williamson Creek Member — White to gray silts, siltstones, and sand beds; some lenses of black chert gravel.

Mdh

Dough Hills Member — Gray to yellow silty clays; light gray clays which may weather to black soil; some siliceous silt and ash beds.

Mlcb

Carnahan Bayou Member — Yellow to gray siltstones, sa and clays with thin tuffaceous beds; some lenses of black ch petrified wood locally.

Lena Member — Gray calcareous clays which may weathe soil; siltstones, tuffaceous clays, and some volcanic ash beds.

Catahoula Formation — *Gray to white sandstones, loose qu* tuffaceous sandstone, volcanic ash, and brown sandy clays; wood locally.

Ov

Vicksburg Group (Undifferentiated) — Brown to gray li with thin interbeds of lignite or micaceous sands; calcare petrified wood, and bluish fossiliferous clay locally.

Jackson Group (Undifferentiated) — Light gray to brown with interbeds of limonitic sands or lignite; near base, calca conitic, and fossiliferous beds may weather to black soil.

Cockfield Formation — Brown lignitic clays, silts, and s sideritic glauconite may weather to brown ironstone in

Cook Mountain Formation — Greenish gray sideritic, gla in upper part may weather to brown ironstone; yellow to and fossiliferous marl in lower part may weather to black sc concretions near base.

Sparta Formation — White to light gray massive sand bedded clays; some thin interbeds of lignite or lignitic sands

Cane River Formation — Brown silty clay with basal glau siliferous silts which may weather to ironstone locally.

Pew

Wilcox Group (Undifferentiated) — Gray to brown lignit silty to sandy lignitic clays, many seams of lignite; some l glauconite. Includes small Carrizo Sand (Claiborne Grou

Midway Group (Undifferentiated) — Dark gray to blac at surface in northwest Caddo Parish and at Prothro and domes in Bienville Parish.

Upper Cretaceous — Fossiliferous limestone and marl at Prothro and Rayburns salt domes in Bienville Parish.

Open Water

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REFERENCE 15

99565

GEOLOGIC DRILL LOG	SITE/SITE ID	PAGE NO.	BORING NO.
	DELTA SHIPYARD/HOUMA, LOUISIANA	1 of1	B02

DATE STARTED	DATE FINISHED	DRILLER	DRILL METHOD	BOREHOLE DIAMETER(in)	TOTAL DEPTH(ft)
7/24/96	7/24/96	GEOENVIRONMENTAL	GEOPROBE	2	24.00

GEOLOGIST	GROUND ELEVATION (ft. MSL)	COORDINATES (ft)
DENNIS HAYES		

DEPTH	SAMPLE INTERVAL	RECOVERY(%)	SAMPLE TYPE	SAMPLE ID	BLOW COUNT	HNU	USCS	GRAPHIC LOG	VISUAL DESCRIPTION	DEPTH
		100				50	CL		SANDY CLAY: dark yellow brown, stiff, slightly moist, slightly plastic, oil stained at 2 feet.	
		0				1000			WATER SATURATED: Lost recovery from 4 to 8 feet due to water.	
5										5
		60	A	1		1000			CLAY: Olive gray, soft to very soft, saturated, medium plasticity, heavy black oil stained 8 to 20 feet. Sample B02-51-1 collected from 9 feet at 5:00 pm.	
10						1000				10
		100							Organics present: (roots, wood chips) 12-13, 14-15, 22-23 feet.	
						1000				
15						1000				15
		60								
						1000				
				2		1000			Sample B02-51-2 collected from 19 feet at 5:10 pm.	
20		60	A							20
						1000				
			A	3		1000			Sample B02-51-3 collected from 23 feet at 5:20 pm.	
									B02 TD=24 FEET	

A = ANALYTICAL SAMPLE
C = COMPOSITE SAMPLE
G = GEOTECHNICAL SAMPLE
L = LITHOLOGIC SAMPLE ONLY
R = ARCHIVED SAMPLE

WESTON

PAGE NO. 1 of1 BORING NO. B02

GEOLOGIC DRILL LOG	SITE/SITE ID	PAGE NO.	BORING NO.
	DELTA SHIPYARD/HOUMA, LOUISIANA	1 of1	B01

DATE STARTED	DATE FINISHED	DRILLER	DRILL METHOD	BOREHOLE DIAMETER(in)	TOTAL DEPTH(ft)
7/24/96	7/24/96	GEOENVIRONMENTAL	GEOPROBE	2	16.00

GEOLOGIST	GROUND ELEVATION (ft. MSL)	COORDINATES (ft)
DENNIS HAYES		

DEPTH	SAMPLE INTERVAL	RECOVERY(%)	SAMPLE TYPE	SAMPLE ID	BLOW COUNT	HNU	USCS	GRAPHIC LOG	VISUAL DESCRIPTION	DEPTH
		100				1000	CL		SANDY CLAY: dark yellow brown, stiff, slightly moist, slightly plastic, sand is very fine grained.	
			A	1		1000			Heavy black oil stained 2 to 3.5 feet. Sample B01-51-1, B01-52-1 collected at 2 feet at 10:30 and 10:40 am. Scattered oily sheen to 16 feet.	
		100							Color change to olive gray. Moist, medium plasticity, soft to very soft.	
5						1000				5
		100				1000			WATER SATURATION.	
10			A	2		400			Sample B01-51-2 collected from 10 feet at 1330.	10
		100				1000				
15						1000				15
									B01 TD = 16 feet.	

A = ANALYTICAL SAMPLE
C = COMPOSITE SAMPLE
G = GEOTECHNICAL SAMPLE
L = LITHOLOGIC SAMPLE ONLY
R = ARCHIVED SAMPLE

WESTON

PAGE NO. 1 of1 BORING NO. B01

REFERENCE 16-NOT USED

REFERENCE 17

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER MATERIAL	SCREEN DIAMETER INTERVAL	DRILL DATE	AVAIL INFO	
109	-5371Z	STAR ENTERPRISE MW-9	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT LAYNE (ENV)	004	17S	18E	[redacted]	17 PA	4 PLASTIC	4 2-17	0492		
109	-5372Z	STAR ENTERPRISE PZ-1	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PRO-TECH	004	17S	18E	[redacted]	12 PA	1.25 PLASTIC	2-12	1092		
109	-5373Z	STAR ENTERPRISE PZ-2	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PRO-TECH	004	17S	18E	[redacted]	12 PA	1.25 PLASTIC	2-12	1092		
109	-5374Z	TE SCHOOL BOARD MW-1	293548 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	101	17S	17E	[redacted]	14 PA	4 PLASTIC	4 4-14	0394	D	W
109	-5375Z	TE SCHOOL BOARD MW-1A	293548 904433	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	101	17S	17E	[redacted]	13 PA	2 PLASTIC	2 3-13	0192	D	W
109	-5376Z	TE SCHOOL BOARD MW-2	293549 904433	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	101	17S	17E	[redacted]	13 PA	4 PLASTIC	4 3-13	0790	D	W
109	-5377Z	TE SCHOOL BOARD MW-3	293548 904433	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	101	17S	17E	[redacted]	13 PA	4 PLASTIC	4 3-13	0790	D	W
109	-5378Z	LA DOTD MW-1R	293553 904220	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	1194	D	W
109	-5379Z	LA DOTD MW-2R	293553 904220	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	1194	D	W
109	-5380Z	LA DOTD MW-4R	293553 904220	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	1094	D	W
109	-5381Z	LA DOTD MW-5R	293553 904220	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	1094	D	W
109	-5382Z	LA DOTD MW-1R	293557 904242	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	16 --	4 PLASTIC	4 6-16	1194	D	W
109	-5383Z	LA DOTD MW-2R	293557 904242	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	16 --	4 PLASTIC	4 6-16	1194	D	W
109	-5384Z	LA DOTD MW-3R	293557 904242	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	008	17S	17E	[redacted]	16 --	4 PLASTIC	4 6-16	1194	D	W
109	-5385Z	LA DOTD MW-1	293554 904221	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT IT CORPORATION	008	17S	17E	[redacted]	12 PA	4 PLASTIC	4 2-12	0192	D	W
109	-5386Z	LA DOTD MW-2	293554 904221	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT IT CORPORATION	008	17S	17E	[redacted]	12 PA	4 PLASTIC	4 2-12	0192	D	W
109	-5387Z	LA DOTD MW-3	293554 904221	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT IT CORPORATION	008	17S	17E	[redacted]	12 PA	4 PLASTIC	4 2-12	0192	D	W

2/14/96 LOUISIANA DOTD - WATER WELL REGISTRATION SYSTEM PAGE 9

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	SECT	TOWN SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER MATERIAL	SCREEN DIAMETER INTERVAL	DRILL DATE	AVAIL INFO	
109	-53[redacted]Z	SHOP RITE RW-1	293507 904444	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	102	17S	17E	RECOVERY	12 --	12 PLASTIC	12 3-12	0393	D	W
109	-5[redacted]5Z	SHOP RITE RW-2	293507 904444	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	102	17S	17E	RECOVERY	12 --	12 PLASTIC	12 3-12	0393	D	W
109	-53[redacted]Z	SHOP RITE RW-1	293507 904444	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	102	17S	17E	RECOVERY	12 --	12 PLASTIC	12 3-12	0393	D	W
109	-5350Z	DIAMOND SHAMROC MW-1	293507 904155	MISS. RIVER ALLUVIAL AQ. SURF. [redacted] UNIT ACADIAN	105	17S	17E	[redacted]	18 --	4 PLASTIC	4 3-18	0394	D	W
109	-5351Z	DIAMOND SHAMROC MW-2	293507 904155	MISS. RIVER ALLUVIAL AQ. SURF. [redacted] UNIT ACADIAN	105	17S	17E	[redacted]	18 --	4 PLASTIC	4 3-18	0394	D	W
109	-5352Z	DIAMOND SHAMROC MW-3	293507 904155	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ACADIAN	105	17S	17E	[redacted]	18 --	4 PLASTIC	4 3-18	0394	D	W
109	-5357Z	DIAMOND SHAMROC MW-4	293507 904155	MISS. RIVER ALLUVIAL AQ. SURF. [redacted] UNIT ACADIAN	105	17S	17E	[redacted]	18 --	4 PLASTIC	4 3-18	0494	D	W
109	-5358Z	DIAMOND SHAMROC MW-5	293507 904155	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ACADIAN	105	17S	17E	[redacted]	18 --	4 PLASTIC	4 3-18	0494	D	W
109	-5359Z	DIAMOND SHAMROC MW-6	293507 904155	MISS. RIVER ALLUVIAL AQ. SURF. [redacted] UNIT ACADIAN	105	17S	17E	[redacted]	18 --	4 PLASTIC	4 3-18	0494	D	W
109	-5360Z	DOWELL SCHLUMBE MW-56	293418 904307	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT GROUNDWATER/	104	17S	17E	[redacted]	14 --	2 PLASTIC	2 3-13	0893	D	W
109	-5361Z	DOWELL SCHLUMBE MW-57	293418 904307	MISS. RIVER ALLUVIAL AQ. SURF. [redacted] UNIT GROUNDWATER/	104	17S	17E	[redacted]	14 --	2 PLASTIC	2 3-13	0893	D	W
109	-5362Z	DOWELL SCHLUMBE MW-58	293418 904307	MISS. RIVER ALLUVIAL AQ. SURF. [redacted] UNIT GROUNDWATER/	104	17S	17E	[redacted]	16 --	2 PLASTIC	2 5-15	0893	D	W
109	-5363Z	DOWELL SCHLUMBE MW-60	293418 904307	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT GROUNDWATER/	104	17S	17E	[redacted]	14 --	2 PLASTIC	2 3-13	0893	D	W
109	-5367Z	SHOP RITE MW-5	293507 904444	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT ENVIRONMENTAL'	102	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	0694	D	W
109	-5368Z	STAR ENTERPRISE MW-6	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EMON	004	17S	18E	[redacted]	10 PA	4 PLASTIC	1-10	0192		
109	-5369Z	STAR ENTERPRISE MW-7	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EMON	004	17S	18E	[redacted]	10 PA	4 PLASTIC	1-10	0192		
109	-5370Z	STAR ENTERPRISE MW-8	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EMON	004	17S	18E	[redacted]	10 PA	4 PLASTIC	1-10	0192		

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	SHIP	RANGE	WELL USE	DEPTH	SUB USE	CASING DIAMETER	CASING MATERIAL	SCREEN DIAMETER	SCREEN INTERVAL	DRILL DATE	AVAIL INFO	
109	-5294Z	CONOCO MW-2	293534 904253	MISS. RIVER ALLUVIAL AQ. SURF. LAYNE (ENV)	007	17S	17E	CONFINING UNIT [redacted]	20 --		4 PLASTIC	4 2-20			0392	D	W
109	-5295Z	CONOCO MW-3	293534 904253	MISS. RIVER ALLUVIAL AQ. SURF. LAYNE (ENV)	007	17S	17E	CONFINING UNIT [redacted]	20 --		4 PLASTIC	4 2-20			0392	D	W
109	-5317Z	CHAUVIN FUNERAL MW-1	293507 904340	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	101	17S	17E	CONFINING UNIT [redacted]	15 PA		4 PLASTIC	4 5-15			0393	D	W
109	-5318Z	CHAUVIN FUNERAL MW-2	293507 904340	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	101	17S	17E	CONFINING UNIT [redacted]	15 PA		4 PLASTIC	4 5-15			0393	D	W
109	-5319Z	CHAUVIN FUNERAL MW-3	293507 904340	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	101	17S	17E	CONFINING UNIT [redacted]	15 PA		4 PLASTIC	4 5-15			0393	D	W
109	-5320Z	DOWELL SCHLUMBE B-4TD	293440 904249	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	20 --		2 PLASTIC	2 9-19			0691	D	W
109	-5321Z	DOWELL SCHLUMBE B-4TS	293439 904249	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	10 --		2 PLASTIC	2 5-10			0691	D	W
109	-5322Z	DOWELL SCHLUMBE B-5TD	293441 904248	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	20 --		2 PLASTIC	2 15-20			1192	D	W
109	-5323Z	DOWELL SCHLUMBE B-15AT2	293439 904247	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	17 PA		2 PLASTIC	2 12-17			0691	D	W
109	-5324Z	DOWELL SCHLUMBE B-19T2	293441 904246	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	12 PA		2 PLASTIC	2 7-12			0691	D	W
109	-5325Z	DOWELL SCHLUMBE B-27T2	293441 904250	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	10 PA		2 PLASTIC	2 5-10			0691	D	W
109	-5326Z	DOWELL SCHLUMBE BG-1	293441 904250	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	12 PA		2 PLASTIC	2 7-12			0691	D	W
109	-5327Z	DOWELL SCHLUMBE C-1	293440 904249	MISS. RIVER ALLUVIAL AQ. SURF. GERAGHTY	101	17S	17E	CONFINING UNIT [redacted]	14 --		2 PLASTIC	2 9-14			1192	D	W
109	-5328Z	DIAMOND SHAMROC MW-1	293639 904440	MISS. RIVER ALLUVIAL AQ. SURF. ACADIAN	005	17S	17E	CONFINING UNIT [redacted]	15 --		4 PLASTIC	4 3-15			0493	D	W
109	-5329Z	DIAMOND SHAMROC MW-2	293639 904440	MISS. RIVER ALLUVIAL AQ. SURF. ACADIAN	005	17S	17E	CONFINING UNIT [redacted]	15 --		4 PLASTIC	4 3-15			0493	D	W
109	-5330Z	DIAMOND SHAMROC MW-3	293639 904440	MISS. RIVER ALLUVIAL AQ. SURF. ACADIAN	005	17S	17E	CONFINING UNIT [redacted]	15 --		4 PLASTIC	4 3-15			0493	D	W
109	-5343Z	SHOP RITE MW-10	293507 904444	MISS. RIVER ALLUVIAL AQ. SURF. ENVIRONMENTAL'	102	17S	17E	CONFINING UNIT [redacted]	20 --		2 PLASTIC	2 3-20			1093	D	W

2/14/96 — LOUISIANA DOTD - WATER WELL REGISTRATION SYSTEM — PAGE 7

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	SHIP	RANGE	WELL USE	DEPTH	SUB USE	CASING DIAMETER	CASING MATERIAL	SCREEN DIAMETER	SCREEN INTERVAL	DRILL DATE	AVAIL INFO	
109	-5273Z	S CENTRAL BELL MW-3	293512 904150	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	101	17S	17E	[redacted]	9	--	4 PLASTIC		4 4-9		0192	D	W
109	-5274Z	S CENTRAL BELL MW-4	293512 904150	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	101	17S	17E	[redacted]	8	--	4 PLASTIC		4 4-8		0192	D	W
109	-5275Z	S CENTRAL BELL MW-5	293512 904150	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	101	17S	17E	[redacted]	8	--	4 PLASTIC		4 4-8		0192	D	W
109	-5276Z	LA DOTD MW-1	293557 904242	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	007	17S	17E	[redacted]	16	PA	2 PLASTIC		2 3-13		0392	D	W
109	-5277Z	LA DOTD MW-2	293557 904242	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	007	17S	17E	[redacted]	16	--	2 PLASTIC		2 3-13		0392	D	W
109	-5278Z	LA DOTD MW-3	293557 904242	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	007	17S	17E	[redacted]	16	--	2 PLASTIC		2 3-13		0392	D	W
109	-5279Z	PENROD DRLG MW-1	293404 904219	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT G & E	012	17S	17E	[redacted]	22	--	4 PLASTIC		4 2-22		0392	D	W
109	-5280Z	PENROD DRLG MW-2	293406 904217	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT G & E	012	17S	17E	[redacted]	22	--	4 PLASTIC		4 2-22		0392	D	W
109	-5281Z	PENROD DRLG MW-3	293402 904214	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT G & E	012	17S	17E	[redacted]	22	--	4 PLASTIC		4 2-22		0392	D	W
109	-5282Z	PENROD DRLG MW-4	293405 904210	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT G & E	012	17S	17E	[redacted]	22	--	4 PLASTIC		4 1-22		0392	D	W
109	-5283Z	PENROD DRLG MW-5	293405 904203	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT G & E	012	17S	17E	[redacted]	23	--	4 PLASTIC		4 2-23		0392	D	W
109	-5284Z	INTERCOASTAL MW-1	293449 904322	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT SHELNUTT	101	17S	17E	[redacted]	14	--	4 PLASTIC		4 4-14		0590		W
109	-5285Z	INTERCOASTAL MW-2	293449 904322	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT SHELNUTT	101	17S	17E	[redacted]	14	--	4 PLASTIC		4 4-14		0590		W
109	-5286Z	INTERCOASTAL MW-3	293449 904322	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT SHELNUTT	101	17S	17E	[redacted]	14	--	4 PLASTIC		4 4-14		0590		W
109	-5288Z	EXXON CO USA MW-1	293624 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT LAYNE (MS)	005	17S	17E	[redacted]	11	PA	4				0388		
109	-5289Z	EXXON CO USA MW-3	293624 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT LAYNE (MS)	005	17S	17E	[redacted]	11	PA	4				0388		
109	-5293Z	CONOCO MW-1	293934 904253	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT LAYNE (ENV)	007	17S	17E	[redacted]	20	--	4 PLASTIC		4 2-20		0392	D	W

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	TOWN SHIP	TOWN RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER / MATERIAL	SCREEN DIAMETER / INTERVAL	DRILL DATE	AVAIL INFO	
109	-5230Z	STAR ENTERPRISE MW-5	293527 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT GROUNDWATER	004	17S	18E	[redacted]	16 PA	2 PLASTIC	2 1-16	1190	D	W
109	-5243Z	CONOCO MW-1	293609 904257	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	007	17S	17E	[redacted]	14 --	2 PLASTIC	2 1-14	0291	D	W
109	-5244Z	CONOCO MW-2	293609 904257	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	007	17S	17E	[redacted]	14 --	2 PLASTIC	2 1-14	0291	D	W
109	-5245Z	CONOCO MW-3	293609 904257	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	007	17S	17E	[redacted]	14 --	2 PLASTIC	2 1-14	0291	D	W
109	-5246Z	CONOCO MW-4	293609 904257	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	007	17S	17E	[redacted]	14 --	2 PLASTIC	2 1-14	0291	D	W
109	-5247Z	EXXON CO USA MW-9	293625 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	005	17S	17E	[redacted]	11 PA	4 PLASTIC	4 1-11	0291	D	W
109	-5248Z	EXXON CO USA MW-11	293625 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	005	17S	17E	[redacted]	11 PA	4 PLASTIC	4 1-11	0291	D	W
109	-[redacted]5Z	TEXACO SOUTHDOW20	293554 904505	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	101	17S	17E	RIG SUPPLY	220 PA	4 PLASTIC	4 210-220	0291	D	W
109	-5263Z	TE CONSOL GOVT A3-MW16-28	293114 904016	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	079	18S	18E	[redacted]	28 --	2 PLASTIC	2 23-28	0391	D	W
109	-5264Z	TE CONSOL GOVT A3-MW17-28	293125 904022	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	079	18S	18E	[redacted]	28 --	2 PLASTIC	2 23-28	0391	D	W
109	-5265Z	TE CONSOL GOVT A3-MW18-33	293133 904021	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	079	18S	18E	[redacted]	33 --	2 PLASTIC	2 28-33	0391	D	W
109	-5266Z	TE CONSOL GOVT A3-MW19-33	293140 904020	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	079	18S	18E	[redacted]	33 --	2 PLASTIC	2 28-33	0391	D	W
109	-5267Z	TE CONSOL GOVT A3-MW20-28	293143 904017	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	059	18S	18E	[redacted]	28 --	2 PLASTIC	2 23-28	0391	D	W
109	-5268Z	TE CONSOL GOVT A3-MW21-28	293143 904013	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	059	18S	18E	[redacted]	28 --	2 PLASTIC	2 23-28	0391	D	W
109	-[redacted]70Z	LA DEQ MW-2A	293547 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT AQUATERRA, INC.	009	17S	17E	RECOVERY	20 --	4 PLASTIC	4 5-15	0991	D	W
109	-5271Z	S CENTRAL BELL MW-1	293512 904150	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	101	17S	17E	[redacted]	9 --	4 PLASTIC	4 4-9	0192	D	W
109	-5272Z	S CENTRAL BELL MW-2	293512 904150	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT EUSTIS	101	17S	17E	[redacted]	12 --	4 PLASTIC	4 4-12	0192	D	W

2/14/96 LOUISIANA DOTD - WATER WELL REGISTRATION SYSTEM PAGE 5
WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER
REQUESTED BY: ROY F. WESTON, INC.
WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293408 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER	CASING MATERIAL	SCREEN DIAMETER	SCREEN INTERVAL	DRILL DATE	AVAIL INFO	
109	-5189Z	BREAUX, GLENN	293413 / 904524	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	10S	17E	[redacted]	205 HH					1089	D	
109	-5201Z	LA UNEMPLOYMENT	293550 / 904315	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	07S	17E	[redacted]	250 HH					0691	D	
109	-5202Z	DAILEY PETRO SE MW-1	293556 / 904533	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / ENCOR	10S	17E	[redacted]	8 --	2 PLASTIC		1-8		0590	D	W
109	-5203Z	DAILEY PETRO SE MW-2	293556 / 904533	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / ENCOR	10S	17E	[redacted]	8 --	2 PLASTIC		1-8		0590	D	W
109	-5204Z	DAILEY PETRO SE MW-3	293556 / 904533	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / ENCOR	10S	17E	[redacted]	8 --	2 PLASTIC		1-8		0590	D	W
109	-5205Z	DAILEY PETRO SE MW-4	293556 / 904533	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / ENCOR	10S	17E	[redacted]	8 --	2 PLASTIC		1-8		0590	D	W
109	-5206Z	EXXON CO USA MW-5	293624 / 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	00S	17E	[redacted]	11 PA	4 PLASTIC		4 1-11		1289	D	W
109	-5207Z	EXXON CO USA MW-6	293624 / 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	00S	17E	[redacted]	11 PA	4 PLASTIC		4 1-11		1289	D	W
109	-5208Z	EXXON CO USA MW-7	293624 / 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	00S	17E	[redacted]	11 PA	4 PLASTIC		4 1-11		1289	D	W
109	-5209Z	EXXON CO USA MW-8	293624 / 904434	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	00S	17E	[redacted]	11 PA	4 PLASTIC		4 1-11		1289	D	W
109	-5217Z	TORCH ENERGY TP-1	293409 / 904158	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / G & E	01Z	17S	17E [redacted]	10 --	2 PLASTIC		2 3-10		1290	D	W
109	-5218Z	TORCH ENERGY TP-2	293412 / 904159	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / G & E	01Z	17S	17E [redacted]	7 --	2 PLASTIC		2 2-7		1290	D	W
109	-5219Z	TORCH ENERGY TP-3	293415 / 904158	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / G & E	01Z	17S	17E [redacted]	10 --	2 PLASTIC		2 3-10		1290	D	W
109	-5226Z	STAR ENTERPRISE MW-1	293527 / 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GROUNDWATER	00Z	17S	18E [redacted]	16 PA	2 PLASTIC		2 1-16		1190	D	W
109	-5227Z	STAR ENTERPRISE MW-2	293527 / 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GROUNDWATER	00Z	17S	18E [redacted]	16 PA	2 PLASTIC		2 1-16		1190	D	W
109	-5228Z	STAR ENTERPRISE MW-3	293527 / 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GROUNDWATER	00Z	17S	18E [redacted]	16 PA	2 PLASTIC		2 1-16		1190	D	W
109	-5229Z	STAR ENTERPRISE MW-4	293527 / 904043	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GROUNDWATER	00Z	17S	18E [redacted]	16 PA	2 PLASTIC		2 1-16		1190	D	W

2/14/96 LOUISIANA DOTD - WATER WELL REGISTRATION SYSTEM PAGE 11

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER MATERIAL	SCREEN DIAMETER INTERVAL	DRILL DATE	AVAIL INFO	
109	-5388Z	LA DOTD MW-4	293554 904221	MISS. RIVER ALLUVIAL AQ. SURF. IT CORPORATION	008	17S	17E	CONFINING UNIT [redacted]	12 PA	4 PLASTIC	4 2-12	0192	D	W
109	-5389Z	LA DOTD MW-5	293554 904221	MISS. RIVER ALLUVIAL AQ. SURF. IT CORPORATION	008	17S	17E	CONFINING UNIT [redacted]	12 PA	4 PLASTIC	4 2-12	0192	D	W
109	-5391Z	TIME SAVER MW-1	293552 904143	MISS. RIVER ALLUVIAL AQ. SURF. SOIL TESTING	008	17S	17E	CONFINING UNIT [redacted]	10 --	4 PLASTIC	4 2-10	0395	D	W
109	-5395Z	WALKER, J & SON MW-1	293545 904309	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	007	17S	17E	CONFINING UNIT [redacted]	15 --	4 PLASTIC	4 5-15	0295	D	W
109	-5396Z	WALKER, J & SON MW-2	293546 904309	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	007	17S	17E	CONFINING UNIT [redacted]	15 --	4 PLASTIC	4 5-15	0295	D	W
109	-5397Z	WALKER, J & SON MW-3	293545 904311	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	007	17S	17E	CONFINING UNIT [redacted]	15 --	4 PLASTIC	4 5-15	0295	D	W
109	-5398Z	WALKER, J & SON MW-4	293545 904310	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	007	17S	17E	CONFINING UNIT [redacted]	15 --	4 PLASTIC	4 5-15	0295	D	W
109	-5399Z	WALKER, J & SON MW-5	293545 904309	MISS. RIVER ALLUVIAL AQ. SURF. STOVER	007	17S	17E	CONFINING UNIT [redacted]	15 --	4 PLASTIC	4 5-15	0295	D	W
109	-5404Z	TEXACO MW-1	293721 904120	MISS. RIVER ALLUVIAL AQ. SURF. BEST	020	17S	17E	CONFINING UNIT [redacted]	18 --	2 PLASTIC	2 3-18	0895	D	W
109	-5405Z	TEXACO MW-2	293721 904120	MISS. RIVER ALLUVIAL AQ. SURF. BEST	020	17S	17E	CONFINING UNIT [redacted]	18 --	2 PLASTIC	2 3-18	0895	D	W
109	-5406Z	TEXACO MW-3	293721 904120	MISS. RIVER ALLUVIAL AQ. SURF. BEST	020	17S	17E	CONFINING UNIT [redacted]	15 --	2 PLASTIC	2 2-15	0895	D	W
109	-5407Z	TEXACO MW-4	293721 904120	MISS. RIVER ALLUVIAL AQ. SURF. BEST	020	17S	17E	CONFINING UNIT [redacted]	15 --	2 PLASTIC	2 2-15	0895	D	W
109	-5417Z	WALKER, J & SON MW-6	293546 904310	MISS. RIVER ALLUVIAL AQ. SURF. HYDRO	007	17S	17E	CONFINING UNIT [redacted]	14 --	4 PLASTIC	4 4-14	1295	D	W

NUMBER OF WELLS SELECTED IN PARISH = 183

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	SECT	TOWN SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER MATERIAL	SCREEN DIAMETER INTERVAL	DRILL DATE	AVAIL INFO	
109	-5162Z	INTRACOASTAL MW-4	293448 / 904321	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GRIFFITH, TOM	101	17S	17E	[redacted]	14 --	4 PLASTIC	4 4-14	0593	D	W
109	-5163Z	INTRACOASTAL MW-5	293448 / 904321	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GRIFFITH, TOM	101	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	0593	D	W
109	-5164Z	INTRACOASTAL MW-6	293448 / 904321	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GRIFFITH, TOM	101	17S	17E	[redacted]	12 --	4 PLASTIC	4 2-12	0593	D	W
109	-5165Z	INTRACOASTAL MW-7	293448 / 904321	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / GRIFFITH, TOM	101	17S	17E	[redacted]	12 --	4 PLASTIC	4 2-12	0593	D	W
109	-5166Z	THOMPSON, DALE	293548 / 904546	NO WELL MADE, LOG DEPTH SHOWN / ACTION	102	17S	17E	[redacted]	250 HH			0189	D	
109	-[redacted]8Z	LEGACY OPERATE KRUMBHAR 1	293721 / 904115	MISSISSIPPI RIVER ALLUVIAL AQUIFER / BROWN, H.	025	17S	17E	RIG SUPPLY	225 PA	4 PLASTIC	4 205-225	0489	D	W
109	-5171Z	NORMAN, DAVID	293418 / 904406	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	103	17S	17E	[redacted]	230 HH			0389	D	
109	-5172Z	RHODES, CALVIN	293422 / 904419	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	103	17S	17E	[redacted]	240 HH			0888	D	
109	-5174Z	BARRETT, HERB	293425 / 904408	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	103	17S	17E	[redacted]	200 HH			0489	D	
109	-[redacted]5Z	TERRA RESOURCES COLE 1	293606 / 904013	MISSISSIPPI RIVER ALLUVIAL AQUIFER / BROWN, H.	022	17S	18E	RIG SUPPLY	225 PA	4 PLASTIC	4 205-225	0489	D	W
109	-5177Z	LEBLANC, TRACY	293415 / 904416	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	103	17S	17E	[redacted]	230 HH			0589	D	
109	-5180Z	LA DEQ MW-1	293547 / 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / WARE LIND	009	17S	17E	[redacted]	14 EX	4 PLASTIC	4 4-14	1089	D	W
109	-5181Z	LA DEQ MW-2	293547 / 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / WARE LIND	009	17S	17E	[redacted]	14 EX	4 PLASTIC	4 4-14	1089	D	W
109	-5182Z	LA DEQ MW-3	293547 / 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / WARE LIND	009	17S	17E	[redacted]	15 --	4 PLASTIC	4 5-15	1089	D	W
109	-5183Z	LA DEQ MW-4	293547 / 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / WARE LIND	009	17S	17E	[redacted]	11 --	4 PLASTIC	4 1-11	1089	D	W
109	-5184Z	LA DEQ MW-5	293547 / 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / WARE LIND	009	17S	17E	[redacted]	13 --	4 PLASTIC	4 3-13	1089	D	W
109	-5185Z	LA DEQ MW-6	293547 / 904118	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / WARE LIND	009	17S	17E	[redacted]	12 --	4 PLASTIC	4 2-12	1089	D	W

2/14/96 LOUISIANA DOTD - WATER WELL REGISTRATION SYSTEM PAGE 3

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER	CASING MATERIAL	SCREEN DIAMETER	SCREEN INTERVAL	DRILL DATE	AVAIL INFO	
109	-5127Z	COASTAL MECHANI	293551 / 904543	NO WELL MADE, LOG DEPTH SHOWN / ROUYEA'S	102	17S	17E	[redacted]	250 / HH					0388	D	
109	-5132Z	BOURG, DAVID	293507 / 904458	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	076	17S	17E	[redacted]	230 / HH					1087		
109	-5134Z	BONVILLIAN, L	293410 / 904518	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	003	17S	18E	[redacted]	230 / HH					0987		
109	-5139Z	BURNER, MARK	293604 / 904517	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	101	17S	17E	[redacted]	245 / HH					1187		
109	-5140Z	LEDET, RANDY	293132 / 904423	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	032	18S	17E	[redacted]	200 / HH					1087		
109	-5141Z	TABOR, JIM	293509 / 904459	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	076	17S	17E	[redacted]	205 / HH					1187		
109	-5144Z	DOYLE, ALEXANDR	293414 / 904453	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	104	17S	17E	[redacted]	200 / HH					0887		
109	-5145Z	DUVAL, STANWOOD	293416 / 904443	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	104	17S	17	[redacted]	220 / HH					0887		
109	-5147Z	SIBILLE, FRED	293418 / 904434	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	104	17S	17E	[redacted]	200 / HH					0488		
109	-5148Z	DAVIS, GENE	293512 / 904458	NO WELL MADE, LOG DEPTH SHOWN / ENDLESS EARTH	076	17S	17E	[redacted]	200 / HH					0488		
109	-5151Z	SCHEXNAIDER'S MW-1	293447 / 904151	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	105	17S	17E	[redacted]	16 / --	4 PLASTIC	4	1-16		1188	D	W
109	-5152Z	SCHEXNAIDER'S MW-2	293447 / 904151	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	105	17S	17E	[redacted]	16 / --	4 PLASTIC	4	1-16		1188	D	W
109	-5153Z	SCHEXNAIDER'S MW-3	293447 / 904151	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	105	17S	17E	[redacted]	16 / --	4 PLASTIC	4	1-16		1188	D	W
109	-5154Z	SCHEXNAIDER'S MW-4	293447 / 904151	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	105	17S	17E	[redacted]	16 / --	4 PLASTIC	4	1-16		1188	D	W
109	-5155Z	SCHEXNAIDER'S MW-5	293447 / 904151	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	105	17S	17E	[redacted]	16 / --	4 PLASTIC	4	1-16		1188	D	W
109	-5156Z	SCHEXNAIDER'S MW-6	293447 / 904151	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT / PSI/PTL	105	17S	17E	[redacted]	16 / --	4 PLASTIC	4	1-16		1188	D	W
109	-5[redacted]Z	HILLARD PETRO HOUMA 1	293511 / 904222	MISSISSIPPI RIVER ALLUVIAL AQUIFER / RIG WATER	008	17S	17E	RIG SUPPLY	200 / --	4 PLASTIC	4	190-200		0492	D	W

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	TOWN SECT	SHIP	RANGE	WELL USE	DEPTH	SUB USE	CASING DIAMETER	CASING MATERIAL	SCREEN DIAMETER	SCREEN INTERVAL	DRILL DATE	AVAIL INFO	
109	-5[redacted]Z	GETTY OIL HOUMA2	293534 904358	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	006	17S	17E	OTHER	260	-I	4 STEEL		4 240-260		0681	D	
109	-5091Z	TE CONSOL GOVT BDS MW-1	293318 904343	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	011	17S	17E	[redacted]	37 PA		2 PLASTIC		2 27-37		0984	D	W
109	-5092Z	TE CONSOL GOVT BDS MW-2	293312 904346	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	011	17S	17E	[redacted]	37 PA		2 PLASTIC		2 27-37		0984	D	W
109	-5093Z	TE CONSOL GOVT BDS MW-3	293310 904346	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	011	17S	17E	[redacted]	37 PA		2 PLASTIC		2 27-37		0984	D	W
109	-5094Z	TE CONSOL GOVT BDS MW-4	293308 904341	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	011	17S	17E	[redacted]	37 PA		2 PLASTIC		2 27-37		0984	D	W
109	-5095Z	TE CONSOL GOVT BDS MW-5	293312 904335	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	011	17S	17E	[redacted]	37 PA		2 PLASTIC		2 27-37		0984	D	W
109	-5096Z	TE CONSOL GOVT BDS MW-6	293320 904339	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT FUGRO (SE)	011	17S	17E	[redacted]	37 PA		2 PLASTIC		2 27-37		0984	D	W
109	-50[redacted]Z	M-H OIL & GAS WALTER 1	293333 903906	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	019	17S	18E	RIG SUPPLY	230 PA		4 PLASTIC		4 210-230		1285	D	W
109	-5101Z	WAGUESPACK, M	293420 904446	NO WELL MADE, LOG DEPTH SHOWN ENDLESS EARTH	104	17S	17E	[redacted]	190 HH						0985	D	
109	-5102Z	LEATHERS, W D	293427 904432	NO WELL MADE, LOG DEPTH SHOWN ENDLESS EARTH	104	17S	17E	[redacted]	200 HH						0586	D	
109	-5104Z	BLANCHARD, W	293457 904213	NO WELL MADE, LOG DEPTH SHOWN ENDLESS EARTH	105	17S	17E	[redacted]	220 HH						0685	D	
109	-5112Z	THERIOT, ELLIS MW-9	293531 904211	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT LAYNE (ENV)	008	17S	17E	[redacted]	17 --		4 OTHER		4 2-17		0492	D	W
109	-5[redacted]Z	HALBOUTY ENERGY PERKINS 1	293618 904036	MISSISSIPPI RIVER ALLUVIAL AQUIFER BROWN, H.	023	17S	18E	RIG SUPPLY	225 PA		4 PLASTIC		4 205-225		0187	D	W
109	-5117Z	MOBIL OIL MW-1	293530 904435	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	102	17S	17E	[redacted]	16 --		4 PLASTIC		4 1-16		0887	D	
109	-5118Z	MOBIL OIL MW-2	293530 904435	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	102	17S	17E	[redacted]	16 --		4 PLASTIC		4 1-16		0887	D	
109	-5125Z	REDDEN, WARREN	293512 904448	NO WELL MADE, LOG DEPTH SHOWN ROUYEA'S	102	17S	17E	[redacted]	250 HH						0388	D	
109	-5126Z	ARCENEAUX, G	293426 904440	NO WELL MADE, LOG DEPTH SHOWN ROUYEA'S	104	17S	18E	[redacted]	240 HH						0388	D	

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

BATON ROUGE

2/14/96 LOUISIANA DOTD - WATER WELL REGISTRATION SYSTEM PAGE 1

WELLRQ1A - REGISTERED WATER WELLS IN TERREBONNE -- SORTED BY WELL NUMBER

REQUESTED BY: ROY F. WESTON, INC.

WITHIN A 4.0000 MILE RADIUS OF LATITUDE 293409 LONGITUDE 904218

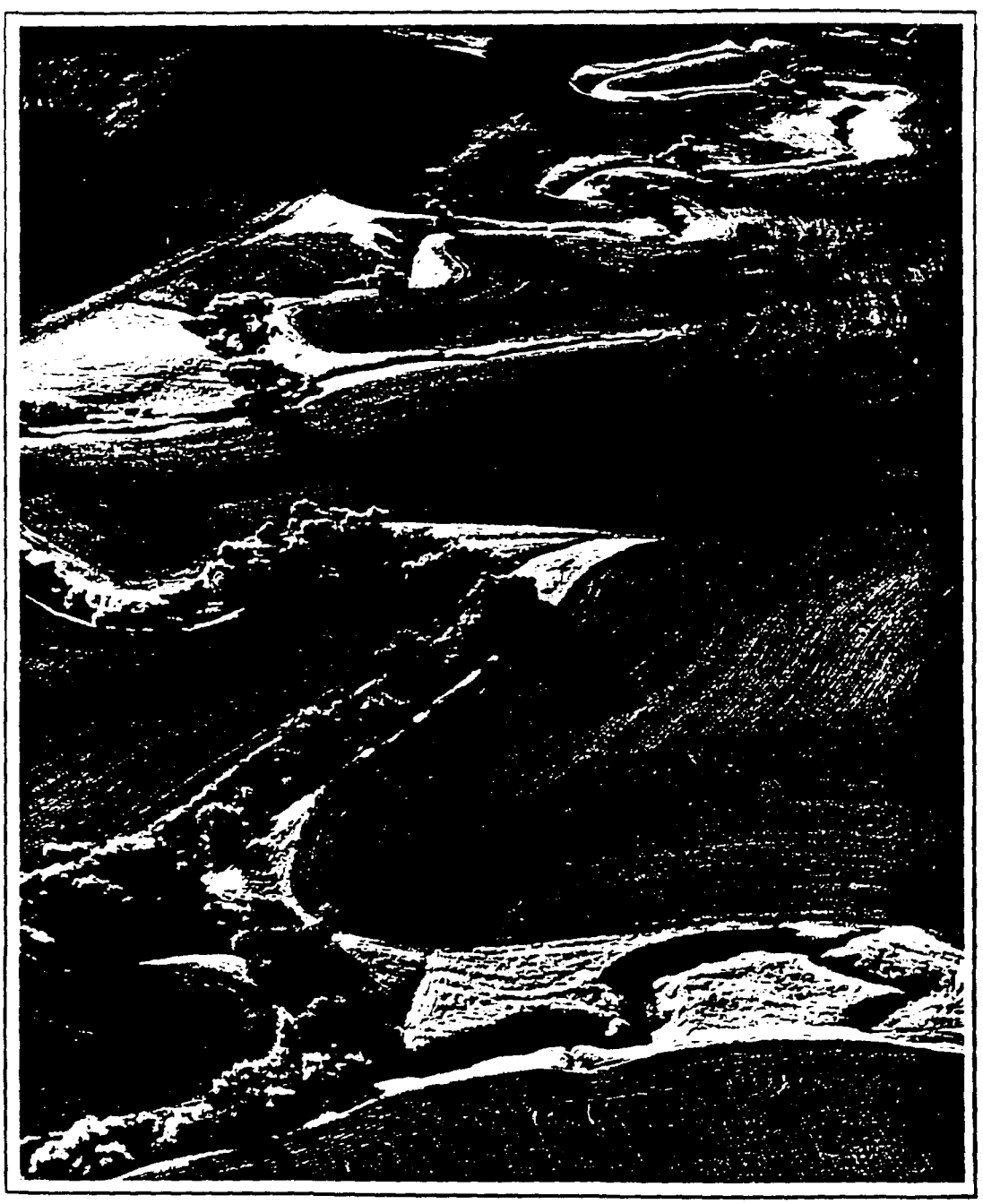
PARISH CODE	WELL NUMBER	OWNER'S NAME / OWNER'S NO.	LATITUDE / LONGITUDE	GEOLOGIC UNIT / DRILLER	SECT	TOWN SHIP	RANGE	WELL USE	DEPTH SUB USE	CASING DIAMETER MATERIAL	SCREEN DIAMETER INTERVAL	DRILL DATE	AVAIL INFO	
109	- [redacted]	MOFIVATIT SEAFO PLANT 1	293621 904235	MISSISSIPPI RIVER ALLUVIAL AQUIFER BRADEN PUMP	096	17S	17E	INDUSTRIAL	280 20	6 STEEL	6 260-280	0688	D	W
109	- [redacted]	MOFIVATIT SEAFO PLANT 2	293608 904434	MISSISSIPPI RIVER ALLUVIAL AQUIFER BRADEN PUMP	006	17S	17E	INDUSTRIAL	274 20	8X6 STEEL	6 254-274	0987	D	W
109	-50[redacted]4Z	PATRICK PETRO SHORE 1	293228 903903	MISSISSIPPI RIVER ALLUVIAL AQUIFER WESTRO	057	18S	18E	RIG SUPPLY	260 PA	4	4 250-260	0980		
109	-5[redacted]05Z	GETTY OIL HOUMA 1	293559 904224	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	008	17S	17E	RIG SUPPLY	280 PA			1180		
109	-5008Z	EXXON CO USA MW-9	293625 904431	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	005	17S	17E	MONITOR	11 --	4 PLASTIC	4 1-11	0790	D	W
109	-5010Z	EXXON CO USA MW-10	293625 904431	MISS. RIVER ALLUVIAL AQ. SURF. CONFINING UNIT PSI/PTL	005	17S	17E	MONITOR	11 PA	4 PLASTIC	4 1-11	0790	D	W
109	-5[redacted]3Z	SAMEDAN OIL SHORE 1	293227 904051	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	001	18S	17E	RIG SUPPLY	320 PA	4 STEEL	4 300-320	0681		
109	-50[redacted]2Z	BLOCKER EXPLORA PELTO 1	293347 904548	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	104	17S	17E	RIG SUPPLY	220 PA	4 STEEL	4 200-220	1081	D	
109	-50[redacted]Z	GETTY OIL HOUMA 8	293534 904354	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	006	17S	17E	RIG SUPPLY	250 PA			1280		
109	-50[redacted]4Z	UNION OIL CALF C GAIDRY 8	293612 904142	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	022	17S	17E	RIG SUPPLY	210 PA	4 PLASTIC	4 200-210	0293	D	W
109	-50[redacted]5Z	GETTY OIL SH18	293512 904342	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	101	17S	17E	OTHER	240 -1	4 STEEL	4 220-240	1281	D	
109	-50[redacted]0Z	MOBIL EXP & PRO BURGUIER 1	293651 904047	MISSISSIPPI RIVER ALLUVIAL AQUIFER BROWN, H.	023	17S	18E	RIG SUPPLY	285 PA	4 PLASTIC	4 265-285	0883	D	W
109	-50[redacted]8Z	COCKRELL OIL SHORE 1	293402 903956	MISSISSIPPI RIVER ALLUVIAL AQUIFER BROWN, H.	020	17S	18E	RIG SUPPLY	205 PA	4 PLASTIC	4 185-205	0784	D	W
109	-50[redacted]1Z	EXCHANGE OIL-GA SDC1	293337 904003	MISSISSIPPI RIVER ALLUVIAL AQUIFER RIG WATER	020	17S	18E	RIG SUPPLY	240 PA	4 PLASTIC	4 210-240	0883	D	
109	-50[redacted]1Z	LADD PETROLEUM SHORE 1	293405 904119	MISSISSIPPI RIVER ALLUVIAL AQUIFER GUICHARD	012	17S	17E	RIG SUPPLY	160 PA	4 PLASTIC	4 141-161	1084	D	
109	-50[redacted]3Z	EPOCH PETRO CULVER 1	293706 904327	MISSISSIPPI RIVER ALLUVIAL AQUIFER GUICHARD	093	17S	17E	RIG SUPPLY	181 PA	4 PLASTIC	4 161-181	0185	D	
109	-50[redacted]9Z	DIASU OIL & GAS SHORE 1	293344 903958	MISSISSIPPI RIVER ALLUVIAL AQUIFER BROWN, H.	020	17S	18E	RIG SUPPLY	245 PA	4 PLASTIC	4 225-245	1085	D	W

REFERENCE 18-NOT USED

REFERENCE 19

Water in Environmental Planning

Thomas Dunne and Luna B. Leopold



WATER
in Environmental Planning

Thomas Dunne

University of Washington

Luna B. Leopold

University of California, Berkeley

W. H. Freeman and Company
New York

Contents

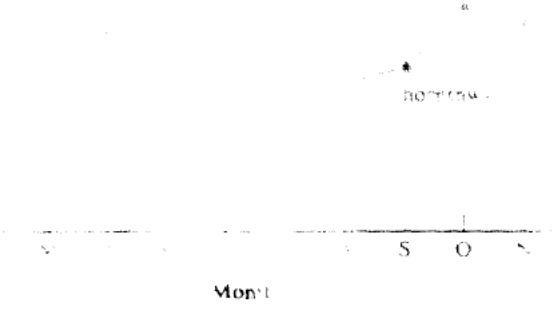


Figure 5- ...easured pan evaporation and calculated potential evapotranspiration at Muguga, Kenya, for 1963. The curve marked "Pan" is measured evaporation. The other three curves are computed values of evapotranspiration using different methods. (After Dagg and Blackie 1970.)

1972). The methods based upon air temperature work best in the regions for which they were developed, namely, midlatitude continental climates, where air temperature is a fairly good index of net radiation. In the tropics, however, these methods often give erroneous results, and may seriously underestimate the amplitude of seasonal fluctuations of water demand (see Figure 5-3). In such areas it is preferable to use the energy-balance approach even if radiation must be estimated. In the tropical world, even data on wind and vapor pressure are relatively rare, but this problem is reduced by the fact that in the tropics the radiation term in the Penman Equation is usually dominant. The temperature methods are still in use, however, and planners concerned with rural areas should be familiar with them.

The Thornthwaite Method

The Thornthwaite method uses air temperature as an index of the energy available for evapotranspiration, assuming that air temperature is correlated with the integrated effects of net radiation and other controls of evapotranspiration, and that the available energy is shared in fixed pro-

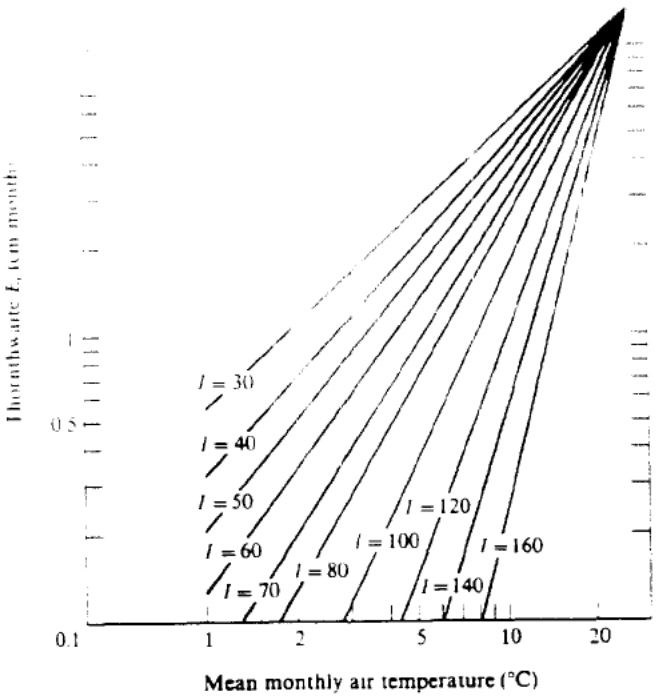


Figure 5-4 Graphical solution of the Thornthwaite formula for potential evapotranspiration, E_t, as a function of mean monthly air temperature for various values of annual heat index, I. The relation of the heat index I to mean annual temperature is shown in Figure 5-5.

...elsewhere. Daily ...nthly potential ...nspiration computed ... Equation 5-8 or obtained ...rom Figure 5-4 ...standard month ... 36... hours of daylight. It must be adjusted for ...the number of days per month and the length of day (a function of latitude). The standard potential evapotranspiration from Figure 5-4 should be multiplied by the appropriate factor given in Table 5-2 to make the adjustment ...for month and latitude.

Table 5-2 Correction factor for monthly sunshine duration for multiplication of the standard potential evapotranspiration from Figure 5-4

LATITUDE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
60°N	0.54	0.67	0.97	1.19	1.33	1.56	1.55	1.33	1.07	0.84	0.58	0.48
50°N	0.71	0.84	0.98	1.14	1.28	1.36	1.33	1.21	1.06	0.90	0.76	0.68
40°N	0.80	0.89	0.99	1.10	1.20	1.25	1.23	1.15	1.04	0.93	0.83	0.78
30°N	0.87	0.93	1.00	1.07	1.14	1.17	1.16	1.11	1.03	0.96	0.89	0.85
20°N	0.92	0.96	1.00	1.05	1.09	1.11	1.10	1.07	1.02	0.98	0.93	0.91
10°N	0.97	0.98	1.00	1.03	1.05	1.06	1.05	1.04	1.02	0.99	0.97	0.96
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10°S	1.05	1.04	1.02	0.99	0.97	0.96	0.97	0.98	1.00	1.03	1.05	1.06
20°S	1.10	1.07	1.02	0.98	0.93	0.91	0.92	0.96	1.00	1.05	1.09	1.11
30°S	1.16	1.11	1.03	0.96	0.89	0.85	0.87	0.93	1.00	1.07	1.14	1.17
40°S	1.23	1.15	1.04	0.93	0.83	0.78	0.80	0.89	0.99	1.10	1.20	1.25
50°S	1.33	1.19	1.05	0.89	0.75	0.68	0.70	0.82	0.97	1.13	1.27	1.36

REFERENCE 20

Delta Shipyard (CERCLIS ID LAD058475419)
Net Annual Precipitation Calculation

Month	Precipitation (inches)	Temperature (degrees F)	Factor	Evaporation (inches)	Net Precipitation (inches)
Jan	4.50	56.4	0.87	1.02	3.48
Feb	4.01	58.8	0.93	1.34	2.67
Mar	5.44	62.6	1.00	1.94	3.50
Apr	4.32	68.9	1.07	3.17	1.15
May	4.41	74.5	1.14	4.64	0.00
Jun	6.32	79.9	1.17	6.24	0.08
Jul	7.86	81.3	1.16	6.61	1.25
Aug	7.73	81.3	1.11	6.33	1.40
Sep	6.57	78.4	1.03	5.12	1.45
Oct	4.13	70.5	0.96	3.14	0.99
Nov	4.64	61.0	0.89	1.53	3.11
Dec	4.75	56.8	0.85	1.03	3.72

Annual Net Precipitation 22.80 inches

$$a = 6.75e\text{-}7\, I^3 - 7.71e\text{-}5\, I^2 + 1.79e\text{-}2\, I + 0.49$$

$$I = \sum_{i=1}^{12} (T_i/5)^{1.5}$$

$$E_i = 1.6 F_i (10 T_i / I)^a$$

E_i = Monthly potential evapotranspiration in inches for month i.

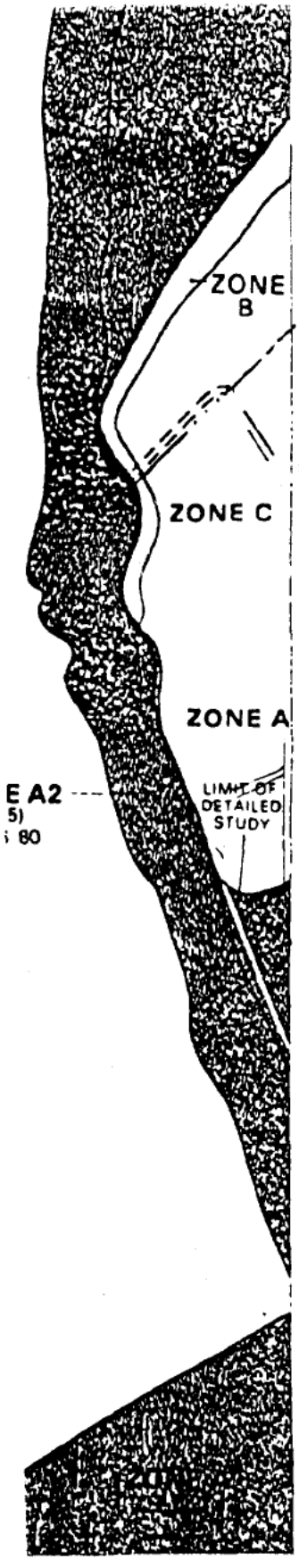
F_i = Monthly latitude adjusting value for month i.

T_i = Mean monthly temperature in degrees Celsius for month i.

Source: Dunne, T. and Leopold, L.B. 1978. Water in Environmental Planning. W.H. Freeman and Company, New York.

REFERENCE 21-NOT USED

REFERENCE 22



APPROXIMATE SCALE

800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TERREBONNE PARISH, LOUISIANA

(UNINCORPORATED AREAS)

PANEL 265 OF 1000

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
225206 0265 C

MAP REVISED:
MAY 1, 1985

Federal Emergency Management Agency

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Please Refer to the File in Superfund Records Center

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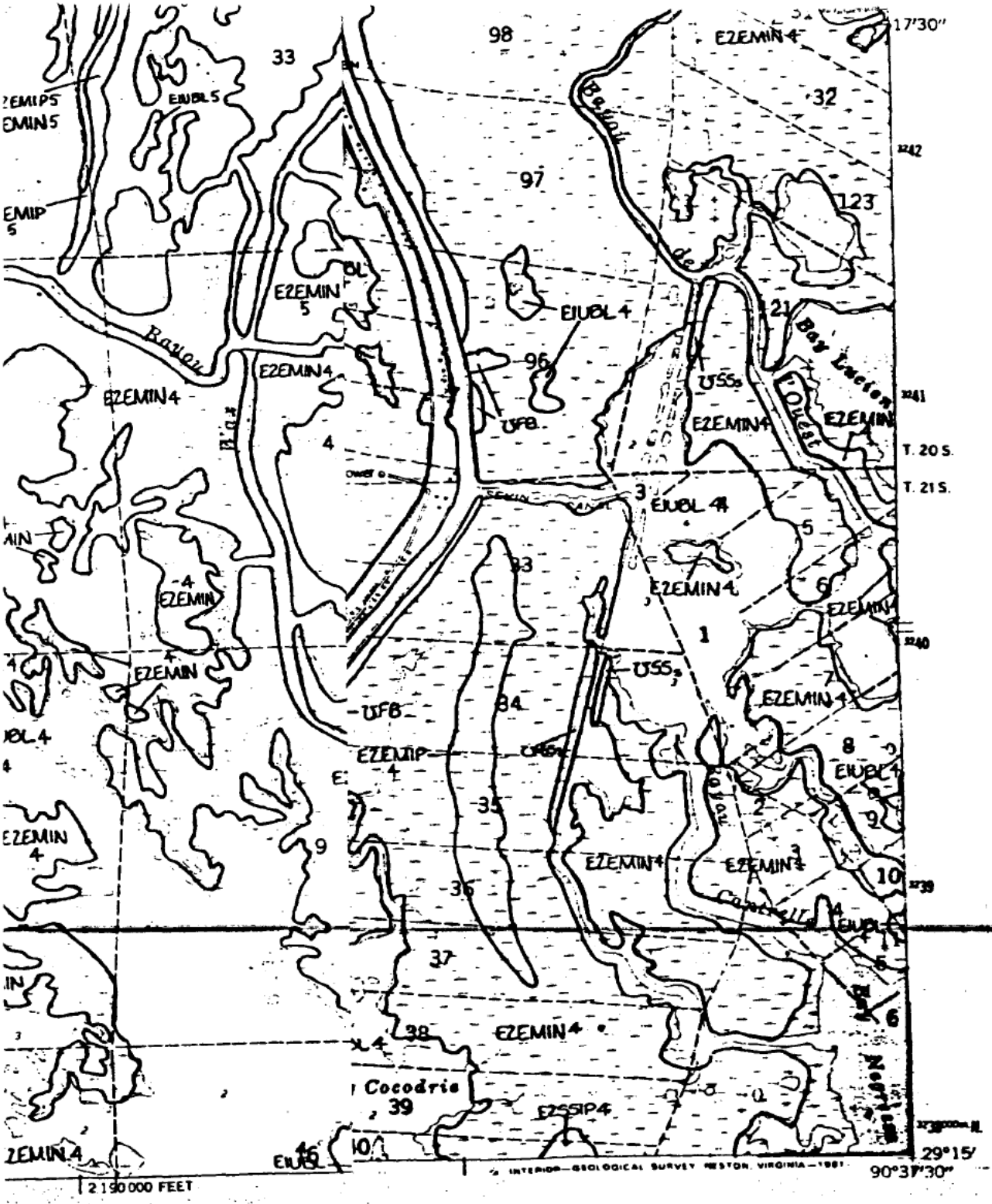
REFERENCE 24-NOT USED

REFERENCE 25-NOT USED

REFERENCE 27



LAKE QUITMAN, LA.

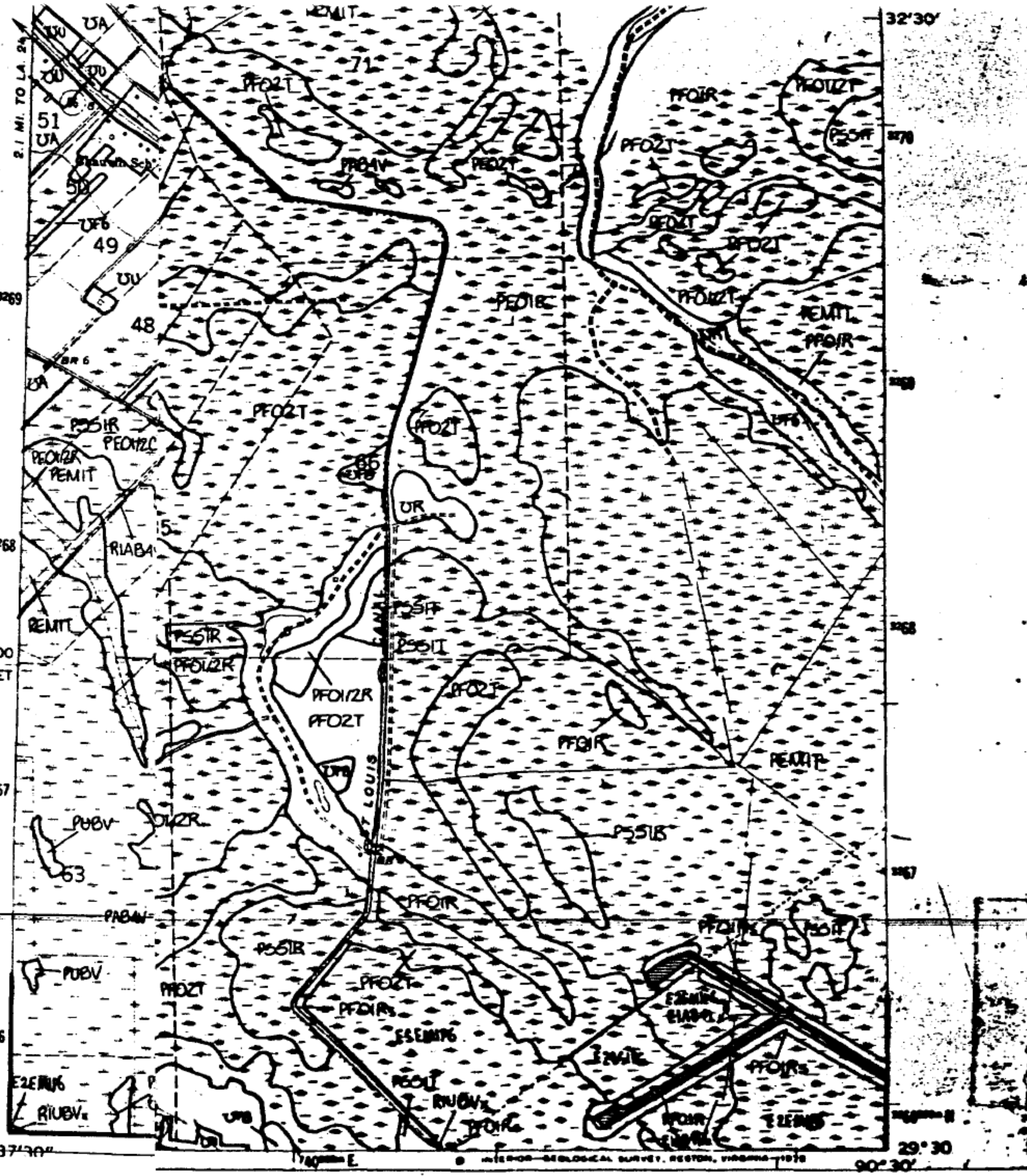
SCALE 1:24000

0 1000 2000 3000 4000

5 0

10 acres

ACREAGE GUIDE



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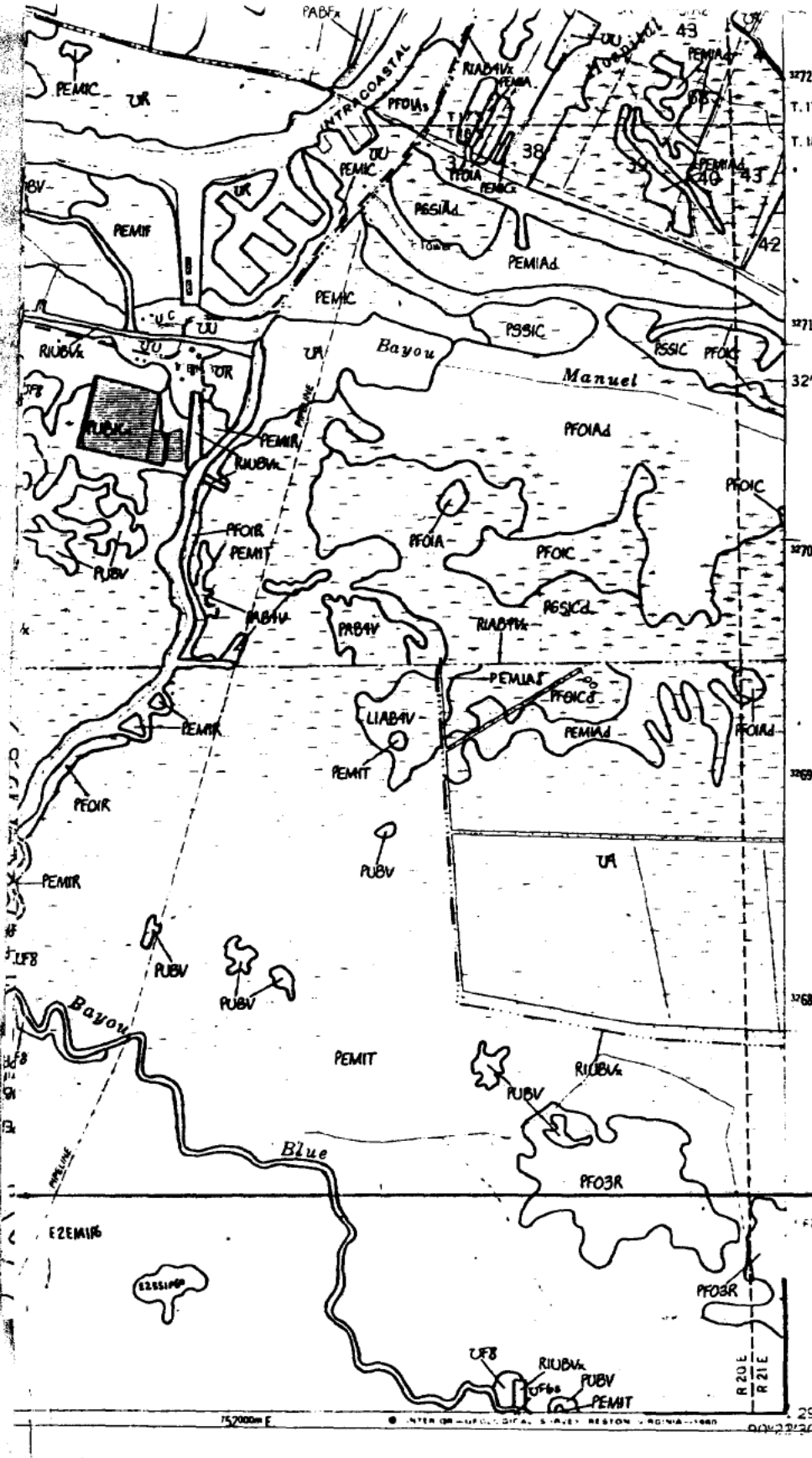

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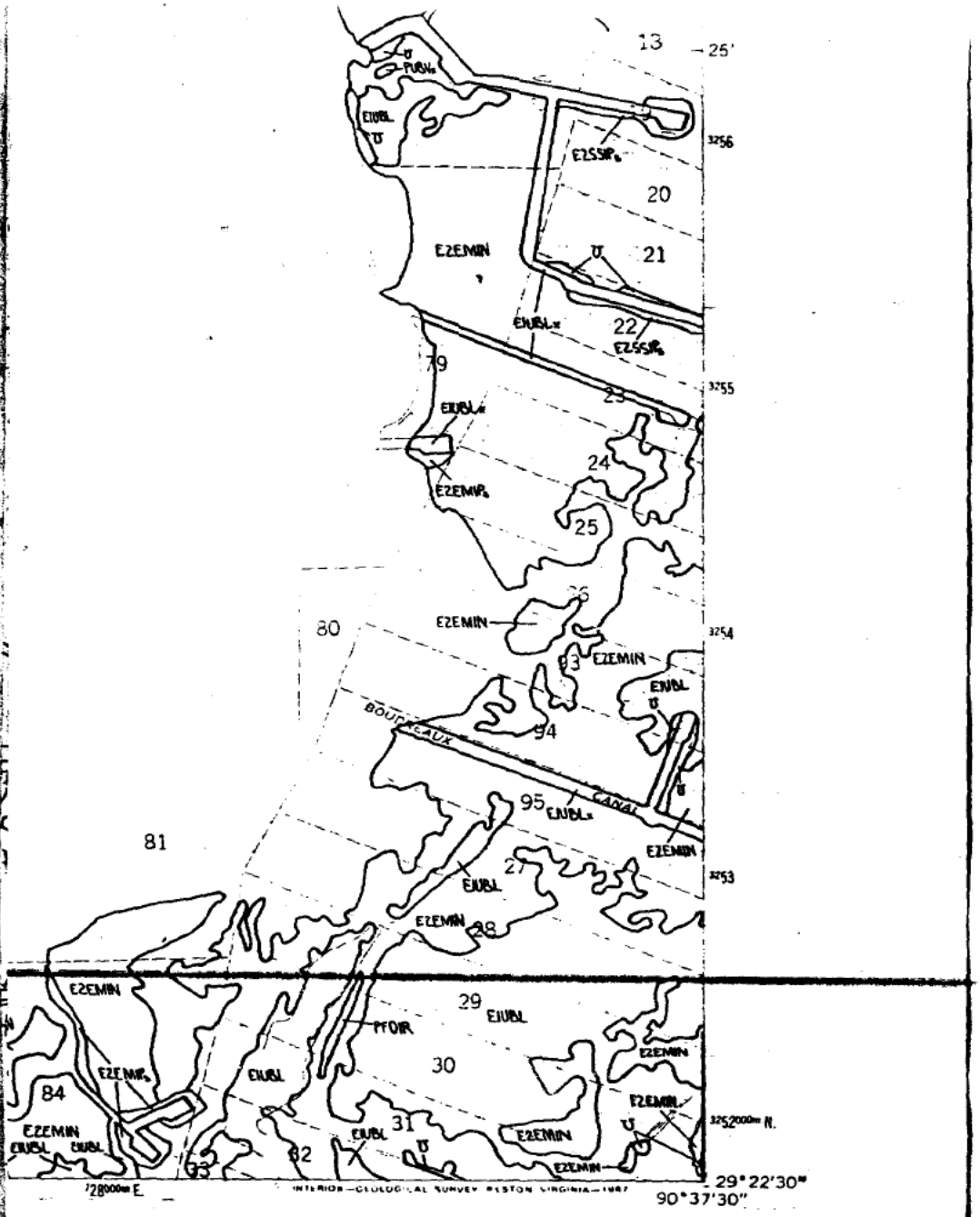

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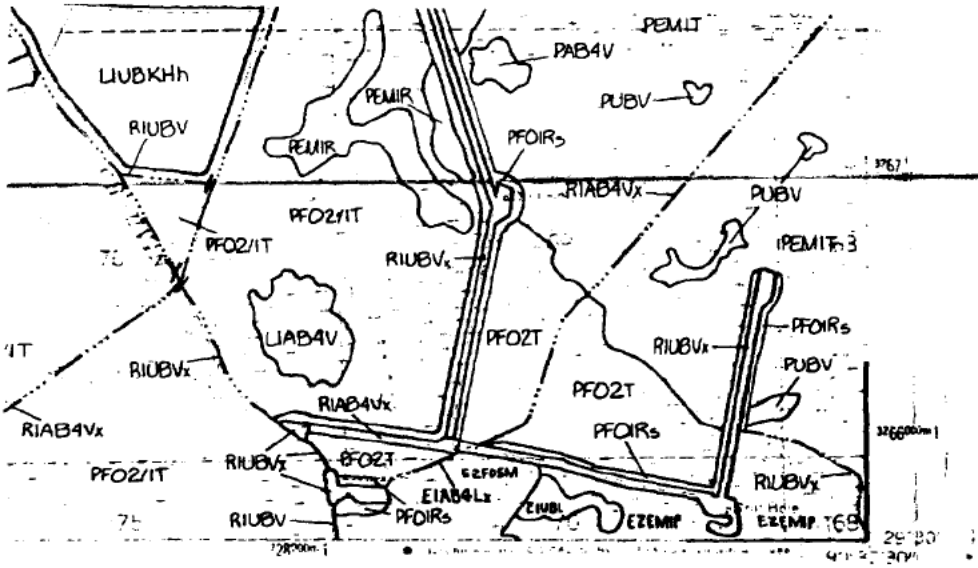
FISH AND WILDLIFE SERVICE

Prepared by National Wetlands Inventory

1992



HOUMA, LA.

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U.S. DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

Prepared by National Wetlands Inventory

1991

GRAPHY

DATE: ____/____/____

CALE: _____

TYPE: _____

SYSTEM

2 — INTERTIDAL

SUBSYSTEM

MBED	RS — ROCKY SHORE	US — UNCONSOLIDATED SHORE	EM — EMERGENT	SS — SCRUB-SHRUB	FO — FORESTED	CLASS
vel	1 Bedrock 2 Rubble	1 Cobble-Gravel 2 Sand 3 Mud 4 Organic	1 Persistent 2 Nonpersistent	1 Broad-Leaved Deciduous 2 Needle-Leaved Deciduous 3 Broad-Leaved Evergreen 4 Needle-Leaved Evergreen 5 Dead 6 *Deciduous* 7 *Evergreen*	1 Broad-Leaved Deciduous 2 Needle-Leaved Deciduous 3 Broad-Leaved Evergreen 4 Needle-Leaved Evergreen 5 Dead 6 *Deciduous* 7 *Evergreen*	Subclass

SYSTEM

2 — LITTORAL

SUBSYSTEM

AB — AQUATIC BED	RS — ROCKY SHORE	US — UNCONSOLIDATED SHORE	EM — EMERGENT	OW — *OPEN WATER/ Unknown Bottom*	CLASS
1 Algal 2 Aquatic Moss 3 Rooted Vascular 4 Floating Vascular 5 *Unknown Submergent* 6 *Unknown Surface*	1 Bedrock 2 Rubble	1 Cobble-Gravel 2 Sand 3 Mud 4 Organic 5 Vegetated	2 Nonpersistent		Subclass

s one or more of the water regime, water chemistry,
The farmed modifier may also be applied to the ecological system.

ATER CHEMISTRY	SOIL	SPECIAL MODIFIERS

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Please Refer to the File in Superfund Records Center

REFERENCE 29

Joy Ishigo
ORIGINATOR

WESTON
PHONE CONVERSATION RECORD

CONVERSATION WITH:

DATE: 3/14/96

NAME: Gerald Adkins (Fishery Biologist)

TIME: 9:30 AM

COMPANY: Louisiana Department of Wildlife and Fisheries

X ORIGINATOR PLACED CALL

ADDRESS:

ORIGINATOR RECEIVED CALL

PHONE: (504) 594-4139

W.O. NO.: 046030260310100-00

SUBJECT: Fisheries in Houma Navigation Canal and Bayou LaCarpe

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NOTES: The area of the Canal in Houma is an industrial area, thus the fishing is limited to catfish. I asked him about crab fishing. He said that there maybe some crab fishing, but because of the traffic from the ships, the crab fishermen do not like the liability caused to them or their equipment. In the canal there is lots of fishing. The freshwater (catfish) occurs in the five mile or less from Houma (in the industrial area). Further south towards the gulf, the freshwater turns to brackish water. This is where the speckle, red, and flounder fishing occur. Also, in the freshwater area, there is bass fishing.

I asked him about the amount of fish taken from the canal. He said he really didn't know. The canal and area that I am interested in may be on a larger grid, and he would not be able to isolate the area. But, he said he would guess that in the industrial area from Houma and five miles away from there it would be about less than 1000 pounds. And, from five miles and south is would increase significantly to maybe 10,000 pounds. But, this is just a rough guess on his part.

FILE:

TICKLE FILE:

FOLLOW-UP-BY:

COPY/ROUTE TO:

FOLLOW-UP-ACTION:

REFERENCE 30-NOT USED

REFERENCE 31-NOT USED

REFERENCE 32

DELTA SHIPYARD

COVERAGE

STATE	COUNTY	STATE NAME	COUNTY NAME
22	57	Louisiana	Lafourche Par
22	109	Louisiana	Terrebonne Par

CENTER POINT AT STATE : 22 Louisiana
COUNTY : 109 Terrebonne Par

REGION OF THE COUNTRY

Zipcode found: 70361 at a distance of 3.3 Km

STATE	CITY NAME	FIPSCODE	LATITUDE	LONGITUDE
LA	HOUMA	22109	29.5967	90.7167

CENSUS DATA

Delta Shipyard
LATITUDE 29:34: 9 LONGITUDE 90:42:17 1990 POPULATION

	SECTOR						
KM	0.00-.400	.400-.810	.810-1.60	1.60-3.20	3.20-4.80	4.80-6.40	TOTALS
S 1	0	0	3593	13252	17001	6642	40488
RING TOTALS	0	0	3593	13252	17001	6642	40488

STAR STATION

WBAN NUMBER	STATION NAME	LATITUDE	LONGITUDE	PERIOD OF RECORD	DISTANCE (km)
12916	NEW ORLEANS/MOISANT LA	29.9833	90.2500	1960-1964	63.6
12958	NEW ORLEANS/CALLENDER LA	29.8167	90.0167	1967-1971	71.9
13970	BATON ROUGE/RYAN LA	30.5333	91.1500	1975-1979	115.4
13976	LAFAYETTE LA	30.2000	91.9833	1954-1958	141.7
93919	MCCOMB/PIKE CO MS	31.2500	90.4667	1949-1954	188.1
13820	BILOXI/KEESLER MS	30.4167	88.9167	1960-1964	196.1
03937	LAKE CHARLES LA	30.1167	93.2167	1966-1970	249.6

REFERENCE 33-NOT USED

REFERENCE 34

ARCS Computer Room

federal register

Friday
December 14, 1990

Part II

Environmental Protection Agency

40 CFR Part 300
Hazard Ranking System; Final Rule

REFERENCE 35